



AGRICULTURAL RESEARCH INSTITUTE

PUSA

The Philippine
Agricultural Review

VOLUME IV

JANUARY TO DECEMBER, 1911

A MONTHLY PUBLICATION

ISSUED IN ENGLISH AND SPANISH BY THE
BUREAU OF AGRICULTURE

DEPARTMENT OF PUBLIC INSTRUCTION
GOVERNMENT OF THE PHILIPPINE ISLANDS

315661
■■■■■■■■■■
IARI

MANILA
BUREAU OF PRINTING
1911

THE PHILIPPINE *Agricultural Review*

INDEX TO VOLUME IV, JANUARY TO DECEMBER, 1911.

SUBJECTS.

Abacá:	Page.
Abacá Waste	14
Agricultural Extension Work, Lecture No. 3, by M. M. Saleeby..	298
Annual Report on for Fiscal Year 1910 by the Director of Agriculture	13
Baling of	613
Cover Crops for	301, 302
Climate for	299
Cultivation of	302
Extraction of Fiber	304
Government Exhibit of, at the 1911 Carnival	194
Harvesting	303
Hemp Export Duty	573
Holing	302
Investigations	13
Liping	301
Low-grade Fiber	14
Market Reports on—	
For December, 1910	101
For January, 1911	162
For February, 1911	219
For March, 1911	272
For April, 1911	326
For May, 1911	385
For July, 1911	577
For September, 1911	635
For October, 1911	688
Mindoro Exhibit of, at the 1911 Carnival	186
Names of Varieties of	13
Overseeing of Harvest	304
Planting	301
Preparation of Soil for	301
Propagation of	300
Quality of Fiber	305
Qualities of Plants for Seed	299
Rainfall as Affecting	299
Range of Prices. (See Range of Prices of Philippine Agricul- tural Products.)	
Renewing of Old Plantation	306

Abacá—Continued.

	Page.
Report of Committee on, at the Surabaya Fiber Congress.....	660
Reports on, by Governors—	
For November, 1910	40
For December, 1910	86
For January, 1911	143
For February, 1911	209
For April and May, 1911	320
For June and July, 1911.....	563
For August and September, 1911	631
Rootstocks for Seed	300
Selection of Varieties	299
Soil for	300
Standard Grades of Fiber	305
Statistics on, in the Philippines, Fiscal Year 1910....	250
Stripping Machines	14
Yield of Fiber	305
Address of Welcome Delivered at the Third Annual Meeting of the Philippine Veterinary Medical Association, by the Governor- General	230
Administrative Division of the Bureau of Agriculture; Annual Re- port on, for Fiscal Year 1910, by the Director of Agriculture ..	7
Agaves; Report of Committee on, at the Surabaya Fiber Congress ..	660
Agricultural Associations:	
Agricultural Development in the Philippines and Agricultural Associations (editorial)	227
Constitution and By-laws of the Insular Agricultural Association of the Philippine Islands	252
Rubber Planters Association in Cochin China ..	269
*Agricultural Banks of the Government of the Philippine Islands ..	266
Agricultural Conditions in Nueva Ecija, by Sam H. Sherard ..	130
Agricultural Conferences: The Development of Philippine Agricul- ture, by Charles V. Piper. Address Delivered at the Conferences Held in Manila from February 21 to 24, 1911	280
Agricultural Exhibits and Expositions:	
Exhibit of Live Stock at the 1911 Carnival ..	176
First Annual Catanduanes Live-stock Exhibition	559
Iloilo Fair	154
In Marinduque	44
In Occidental Negros	44
International Rice Congress at Vercelli, Italy	574
List of Prize Winners at the 1911 Carnival	180
Moro Province Fair at Zamboanga.....	155
Pangasinan Fair	150
Provincial Exhibits at the 1911 Carnival	182
Provincial Fairs (editorial)	106, 589
The Bacolod Fair	153
The Government Exhibits at the 1911 Carnival.....	190
Agricultural Extension Work; Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	9
Agricultural and Trade Conditions of Samoa for 1909 ..	381

Agriculture along the Philippine Railway, Panay, by W. A. Mace:	Page.
Introduction	616
Soils	616
Topography	617
Climate	617
Animals	617
Farm Implements	618
Principal Crops	618
Irrigation	624
Transportation	624
Alabang Stock Farm:	
Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	28
Austrian Dairy Herd at	29
Alabang Stock Farm:	
Cattle at	29
Corn at	28
Fertilizer Experiments at	28
Guinea Pigs at	29
Horses at	29
Improvements at	28
Labor at	28
Locusts at	28
Para Grass at	29
Principal Crops Grown at	28
Sorghum at	29
Sugar Cane at	29
Surra at	29
Varieties of Rice at	18
Alcohol; Bureau of Internal Revenue Exhibit at the 1911 Carnival ..	197
Ambos Camarines; Locusts in	44
Animal Census of the Philippine Islands at beginning of Fiscal Year, 1911	373
Animal Diseases:	
Anthrax in Formosa	369
Blackleg in Formosa	370
Bovine Tuberculosis in Formosa	370
Executive Orders—	
Declaration and Quarantine Order Regarding Rinderpest in Certain Provinces	229
No. 24; Prevention and Suppression of Animal Diseases ..	285
In Australia	542
Infected Shipments of Cattle from Hongkong	644
In Formosa	369
Institute for, in Japan	115
In the Moro Province	141
Monthly Veterinary Reports—	
November, 1910	37
December, 1910	84
January and February, 1911	139
February and March, 1911	206

Animal Diseases—Continued.	Page.
Monthly Veterinary Reports—Continued.	
March and April, 1911	260
May and June, 1911	374
August and September, 1911	561
September and October, 1911	629
October and November, 1911	684
Pleuro-pneumonia in Australia	542
Pleuro-pneumonia in Live Stock from Australia	540
Review of the Scope and Methods of Tropical Veterinary Entomology, by M. B. Mitzmain	666
Swine Plague in Formosa	370
The Rinderpest Problem, article by Archibald R. Ward, Chief Veterinarian	337
The Rinderpest Problem (editorial)	333
Tuberculosis in the Philippines	472
Animal Husbandry; Outlook for, in the Philippines	412
Annual Report of the Director of Agriculture for the Fiscal Year ending June 30, 1910	7-31
Another Mango Pest in the Philippines, by P. J. Wester	649
Anthrax, in Formosa	369
Antique:	
Extension Work Lectures in	127
School Gardens in	157
Apiculture in the Philippines	682
Australia:	
Animal Diseases in	542
Australian Dairy Herd at Alabang Stock Farm	29
Importation of Cattle from	540
Importation of Cattle from when designed for slaughter (G. O. No. 2)	534
Pleuro-pneumonia in Cattle from	540
Avocados:	
Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	16
Artificial Fertilizers Used in Propagation of	601
At Singalong Experiment Station	16
Methods of Propagating	599
Selection of Bud-wood for Shield-budding	602
Shield-budding	603
The Propagation of, by P. J. Wester	599
Tools Used in Shield-budding	602
Tying Material for Shield-budding	603
Watering in Propagation of	600
Bacolod; Agricultural Fair at	153
Baguio Experiment Station:	
Beans at	96
Strawberries at	96
Tomatoes at	96
Balance of Philippine Trade for the Year 1910	267

	Page.
Baling of Fibers, by M. M. Saleeby	613
Bananas:	
Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	16
At Llamao	16
Bag-worm Infesting in Cebu	556
Banana Cultivation in Jamaica	98
Leaf Roller in Misamis	557
Notes on the Cultivation of	216
Varieties Grown at Llamao—	
Chinese Dwarf	16
Gloria	16
Lacatan	16
Latundan	16
Matavia	16
Sabá	16
Barbone. (<i>See</i> Hemorrhagic Septicemia.)	
Basilan; Robusta Coffee Seed for	18
Bataan:	
Extension Work Lectures in	127
Rinderpest in	561, 629
Batangas:	
Caterpillars in	12
Oranges in	87, 94, 268
Birds, Detrimental; the English Sparrow in the Philippines	91
Blackleg; in Formosa	370
Blight-resistant Coffees	570
Bohol; Exhibit at the 1911 Carnival	186
Bolivia; Export of Coca from	625
Book Reviews, by O. W. Barrett:	
For October; "Notes on the Soil and Plant Sanitation of Cacao and Rubber Estates," Harold Hammel Smith	576
For December—	
Cacao	686
<i>Les Kolatiers et Les Noix De Kola</i>	687
Breeds of Milch Cattle and Carabaos for the Philippines, by David G. Fairchild	501
Brief Report on the Veterinary Institutions of Japan, by R. F. Knight and C. G. Thomson	111
British East Indies; Sugar Conditions in	215
Bukidnon; School Farming in, by Lewis S. Thomas	349
Bulacan:	
Exhibit at the Philippines Carnival	183
Extension Work Lectures in	127
Field Operations against Rinderpest in, by Archibald R. Ward	68
Rinderpest in	561
Bureau of Agriculture:	
Administrative Division	7
Agricultural Extension Work	10
Crop Reporting and Statistics	10

Bureau of Agriculture—Continued.

	Page.
Division of Animal Industry.....	20
Control Work	21
Foot-and-mouth Disease	23
Hemorrhagic Septicemia	23
Matadero Inspection	25
Quarantine Stations—	
At Cebu	25
At Iloilo	24
At Manila	24
Rinderpest	21
San Lazaro Immunizing Station	25
Serum Laboratory	25
Stock Farms—	
At Alabang	28
At Trinidad	30
Surra	22
Division of Plant Industry	13
Exhibit at Philippines Carnival	193
Experiment Stations	18
Baguio	19
Ilagan Tobacco Station	20
La Carlota	20
Lamiao	20
Notes on the Baguio Station	96
Singalong	19
Trinidad Garden	265
Extension Work Lectures—	
Article on, by H. T. Edwards	126
No. 3, by M. M. Saleeby	298
Forage Factory	11
Fruit Expert for	267
Library	9
Miscellaneous Publications	9
Plant Investigations; Abacá	13
Publications	8
Quarantine Stations	23
Seed Distribution	18
The Philippine Agricultural Review	8
Bureau Exhibits at the 1911 Carnival:	
Agriculture	193
Education	199
Forestry	198
Health	190
Internal Revenue	196
Printing	201
Public Works	202
Science	197
Cacao:	
Review of Hart's Manual on	686
Rubber and Cacao	215

	Page
Cagayan:	
Rinderpest in	561, 629
Tobacco Cleaning in	678
Camotes; Along the Philippine Railway, Panay.....	623
Camp Vicars Potato Farm, by O. W. Barrett.....	65
Climate at	65
Lyon Beans at	67
Seed Used at	66
Soil at	66
Capiz; Extension Work Lectures in	127
Carabaos:	
Article on	487
Census of, in the Philippines at beginning of Fiscal Year, 1911 ..	373
Exhibit of, at the 1911 Carnival	178
Prize Winners at the 1911 Carnival	180
Total Loss of, from Rinderpest, 1910, Davao Outbreak	246
Carnival. (See Philippines Carnival.)	
Catanduanes; First Annual Live Stock Exhibition at	559
Cattle:	
Animal Industry in the Philippines (editorial)	467
Article on	484
At Alabang Stock Farm	29
At La Carlota Experiment Station	20
Bovine Tuberculosis in Formosa	370
Breeds for Beef-cattle Raising	487
Breeds for Dairy Purposes in the Philippines	486
Breeds Imported by the Bureau of Agriculture	485
Breeds of Milch Cattle for the Philippines	501
Census of, in the Philippine Islands at beginning of Fiscal Year 1911	373
Chinese and Galloway-Chinese Crosses at Alabang Stock Farm	29
Executive Orders	
Declaration and Quarantine Order Regarding Rinderpest in Certain Provinces	229
No. 24; Prevention and Suppression of Animal Diseases	285
Exhibit at the Iloilo Fair	154
Exhibit at the Moro Province Fair	156
Exhibit of, at the Philippines Carnival	177
Foreign-native Crosses at the 1911 Carnival	178
Importation of--	
From Australia	540
When designed for slaughter (G. O. No. 2)	534
From Australia, Tasmania, and New Zealand (G. O. No. 1)	532
From Pnum Penh	643
Into the Philippines 1908 10	509
Imported Dairy Animals at the 1911 Carnival	178
Indian Cattle in the United States	366
Infected Shipments of, from Hongkong	644
Foot-and-mouth Disease in the Importation of	24
Live Stock at Trinidad Stock Farm	30
Native Cattle as a Source of Beef Supply	119

Cattle—Continued.	Page.
Nellore Cattle at the 1911 Carnival	178
Prize Winners at the 1911 Carnival	180
Regulations Relative to Laws of the Netherlands India Govern- ing Importation of	371
Some Phases of the Problem of Importation of Cattle into the Philippines, by Archibald R. Ward	643
Total Loss of, from Rinderpest, 1910 Outbreak, Davao	246
Cavite:	
Exhibit at Philippines Carnival	183
Extension Work Lectures in	127
Mango Pest in	312, 681
Cebu:	
Bag-worm Infesting Bananas in Cebu	556
Cultivation of Tobacco in	316
Description of Tobacco Leaf Grown in	315
Extension Work Lectures in	127
Lepidoptera Infesting Pomelo Trees in	556
Method of Curing Tobacco in	317
Plant Pests in	555
Planting Season for Tobacco in	316
Report on Tobacco in	315
Rinderpest in	561
Soil in	315
Topography of	315
Cebu Quarantine Station; Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	25
Central Luzon Agricultural School in Nueva Ecija	138
Central Sugar Factory in St. Kitts	383
Ceylon; Copra Trade in, for 1910	270
China; Modern Sugar Mills in	269
Citrus Fruit-flies in Mindanao	557
Citrus Fruits:	
Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	15
At Lamao	15
<i>Loranthus secundiflorum</i> Infesting, in Misamis	557
Classes of Vegetation in the Philippine Islands	472
Grass Lands	472
Second-growth Forests	473
Virgin Forests	475
Climate:	
Along the Philippine Railway, Panay	617
At Camp Vicars Potato Farm	65
At Trinidad Garden	265
For Abacá	299
In the Philippine Islands	475
Rainfall Affecting Abacá	299
Coca:	
A New Crop for the Philippines	625
Export of, from Bolivia	625

	Page.
Cochin China; Rubber Planters Association in	269
Coconuts:	
Along the Philippine Railway, Panay	623
A New Pest Attacking	628
Bureau of Agriculture Exhibit at the 1911 Carnival	195
Coconut Butter	381
Coming Boom in	628
Copra Trade in the Philippines	571
Damage to, by Wild Hogs	12
In La Laguna	151
Monthly Reports on by Governors---	
For November, 1910	42
For January, 1911	143
For February and March, 1911 ..	209
For April and May, 1911	321
For May and June, 1911	376
For June and July, 1911	564
For August and September, 1911	631
Rhinoceros Beetle Infesting, in Oriental Negros ..	557
Statistics on, in the Philippine Islands, Fiscal Year 1910	364
Coffee:	
Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	15
At Singalong Experiment Station	15
Blight-resistant Coffees	570
In Java	662
Liberian, at Lamao	15
Maragogepe at Singalong	15
Reports on, by Governors	
For December, 1910	86
For January, 1911	143
Robusta, at Lamao Experiment Station	571
Robusta Seed for the Mountain Province and Basilan	18
College of Veterinary Science, University of the Philippines:	
Article on, by Dr. Alvin Broerman, D. V. M	288
Buildings and Location	289
Editorial on	277
Entrance Requirements	289
Governments Scholarships in	291
Length of Course of Study	241
Coming Boom in Coconuts	628
Control Work; Annual Report on, for Fiscal Year 1910, by Director of Agriculture	21
Copra:	
Copra Drying	160
Copra Trade in Ceylon for 1910	270
Copra Trade in the Philippines	571
Importance of Crop	571
Growth of Trade with the United States	572
Driers for	153, 680

Copra—Continued.

Page.

Market Reports on—

For January, 1911	162
For February, 1911	219
For March, 1911	272
For April, 1911	326
For May, 1911	385
For July, 1911	577
For September, 1911	635
For October, 1911	688

Prices of	627
-----------------	-----

Production of, in La Laguna	153
-----------------------------------	-----

Regulations for Dealing in, in Samoa	628
--	-----

Corn:

Along the Philippine Railway, Panay	620
---	-----

Annual Report on, for Fiscal Year 1910, by the Director of

Agriculture	18
-------------------	----

At Alabang Stock Farm	28
-----------------------------	----

At Singalong Experiment Station	17
---------------------------------------	----

Bureau of Agriculture Exhibit at the 1911 Carnival.....	194
---	-----

Corn-blade Fodder	593
-------------------------	-----

Corn-leaf Blight in the Philippines, by C. B. Robinson ..	356
---	-----

In Nueva Ecija	134
----------------------	-----

Maize as a Catch Crop	160
-----------------------------	-----

Monthly Reports on by Governors—

For November, 1910	42
--------------------------	----

For December, 1910	86
--------------------------	----

For January, 1911	143
-------------------------	-----

For February and March, 1911	209
------------------------------------	-----

For April and May, 1911	321
-------------------------------	-----

For May and June, 1911	376
------------------------------	-----

For June and July, 1911	566
-------------------------------	-----

For August and September, 1911	632
--------------------------------------	-----

Pop Corn in the Philippines	683
-----------------------------------	-----

Range of Prices. (See Range of Prices of Philippine Agricultural Products.)

Statistics on, in the Philippine Islands, Fiscal Year 1910 ..	362
---	-----

Cotton:

In Java	661
---------------	-----

Reports on, by Governors—

For December, 1910	86
--------------------------	----

For January, 1911	144
-------------------------	-----

Seed for the Mountain Province and Mindanao	18
---	----

Crops Planted and Harvested:

For the Quarter Ending September 30, 1910	169
---	-----

For the Quarter Ending December 31, 1910	328
--	-----

For the Quarter Ending March 31, 1911.....	583
--	-----

Crop Reporting and Statistics; Annual Report on, for Fiscal Year 1910, by the Director of Agriculture

10

Cuba; Sugar Matters in	271
------------------------------	-----

Cultivated Forage Crops in the Philippines ..	400
---	-----

	Page.
Cultural Directions for Young Pará Rubber; Extension Work Circular No. 3, by O. W. Barrett	122
Removal from Seedbed	122
Planting	122
Holes	123
Cultivation	123
Current Notes:	
For November, 1910	44
For January, 1911	91
For May, 1911	265
For October, 1911	570
For November, 1911	625
For December, 1911	678
Dangerous New Weed in the Philippines, A (Spread of "Lantana Camara" in Negros), by O. W. Barrett	82
Davao:	
Efficiency of Scouts as Quarantine Guards in, 1910 Rinderpest Outbreak	247
Factors Contributing to Suppression of 1910 Outbreak of Rinderpest in	247
Infected Rinderpest Area in, 1910 Outbreak of Rinderpest	245
Number of Animals Slaughtered in, 1910 Rinderpest Outbreak	246
Report on the Recent Outbreak of Rinderpest in	243
Scouts as Quarantine Guards in	244
Slaughter of Infected Rinderpest Animals in, 1910 Outbreak	246
Source of Rinderpest Infection, 1910 Outbreak in	247
Total Loss of Animals in, from Rinderpest, 1910 Outbreak	246
Declaration and Quarantine Order Regarding Rinderpest in Certain Provinces	229
Deer and Cattle Disease. (<i>See Hemorrhagic Septicemia.</i>)	
Development of Philippine Agriculture, by Charles V. Piper	280
Directions for Taking Soil Samples	92
Sub-soil	92
Surface Soil	92
Division of Animal Industry; Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	20
Division of Plant Industry; Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	13
Editorial:	
Agricultural Development in the Philippines and Agricultural Associations	227
Animal Industry in the Philippines	467
College of Veterinary Science	277
Get the Carnival Spirit	49
Monthly Summary of Crop Conditions	279
Our Provincial Fairs	106
Provincial Fairs	589
Rice Famine	530
Statistical Maps on Philippine Crops	228
The Carnival as a Factor in Agricultural Development	174

Editorial—Continued.

	Page.
The Conservation Policy for the Philippines	1
The Forage Problem in the Philippines	392
The Locust Situation	335
The New Director of the Bureau of Agriculture	641
The Review and the Carnival	174
The Rinderpest Campaign	51
The Rinderpest Problem	333
The Rinderpest Situation and the People	225
The Tobacco Beetle	590
The Use of Fertilizers in the Philippines	50
Vegetable Gardens in the Philippines	334
Veterinary Work in Japan	106
Education, Bureau of; Exhibit at the 1911 Carnival	199
English Sparrow in the Philippines, The	91
Poison for	91
Estimated Cost of Laying Out a Rubber Estate	380
Executive Orders:	
Declaration and Quarantine Order Regarding Rinderpest in Certain Provinces	229
No. 13, Providing for Monthly Reports on Crop Conditions by Provincial Governors	294
No. 24, Prevention and Suppression of Cattle Diseases	285
Experiments in Mango Propagation	97
Experiment Stations; Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	18
Exports. (<i>See</i> Principal Philippine Imports and Exports.)	
Expositions and Exhibits. (<i>See</i> Agricultural Exhibits and Expositions.)	
Extension Work:	
Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	9
Bureau of Agriculture Lectures—	
Article on by H. T. Edwards	126
In Antique	127
In Bataan	127
In Bulacan	127
In Capiz	127
In Cavite	127
In Cebu	127
In Ilocos Norte	128
In Ilocos Sur	128
In Iloilo	128
In Isabela	128
In La Union	128
In Leyte	128
In Mindanao	128
In Nueva Ecija	128
In Occidental Negros	128
In Oriental Negros	128
In Pangasinan	129
In Sorsogon	129
No. 3, by M. M. Saleeby	298

	Page.
Extension Work Circular No. 3, Cultural Directions for Young Pará Rubber, by O. W. Barrett	122
Extracts from Report of the Proceedings of a Board of Officers of the Civil Government of the Philippine Islands and of the U. S. Army, Appointed by the Secretary of War	429
Order Convening the Board	429
First Meeting of the Board	430
Instructions to the Recorder	431
Recorder's Report	431
Various Feeds in the Philippine Islands	432
Forage Imported into the Philippines	433
Daily Feeds in Private Stables	434
Daily Feeds in the Various Government Departments	434
Native Grass	435
Crushed Feeds	443
Recommendations	445
Tests Being Made	450
Present Division Forage Ration, with Cost	451
Nutritive Ratios	452
G. O. No. 88, Philippines Division, Forage	453
Forage Raising at Trinidad Stock Farm	453
Corn-blade Fodder	454
Report on Feeding Tests	457
Results to Date	461
Report of Committee on Beef	503
Estimate of Number of Native Cattle Available November 1, 1910, in the Philippines, in Vicinity of Military Posts, with Estimated Weight Dressed and Cost per Pound in Gold	506, 507
Native Beef Supply	506
Importations of Cattle into the Philippines, for the Fiscal Years 1908-10	509
Opinions from 48 Army Posts in the Philippines, as to the Palatability of Native Beef, Compared to the Frozen Australian Beef now Furnished the Army	509
Reports of Various Military Authorities on Native Philippine Beef	510, 511, 512
Native Beef Handled by the Leading Meat Dealers and Cold-Storage Companies of Manila during the past Year	512
Cattle Diseases now Existing in the Philippine Islands, 1910	513, 514
Statistics Relating to Diseases of the Islands; Compiled from Weekly Reports of Veterinarians and Inoculators, Published in the Agricultural Review of January, 1910	514
Cattle Ranches	515
Fertilizers:	
Application	64
Article on, by C. M. Conner	53
Artificial Fertilizers Used in Propagation of Avocado	601
Average Composition of Farm Manures	61
Elements which Plants Derive from Soil	34
Experiments at Alabang Stock Farm	28
Farm Manures	60
Field Tests for	56

Fertilizers—Continued.

	Page.
Filler	62
Home Mixing of	63
Market Value of	61
Materials Sometimes Used for	60
Fish and Fish Scrap	60
Natural Guanos	60
Tankage	60
Nitrogen	57
Dried Blood	58
Nitrate of Soda	57
Sulphate of Ammonia	58
Phosphoric Acid—	
Acid Phosphate	58
Basic Slag	59
Bones	59
Potash, Potash Salts	59
Sources of the Raw Materials for	57
Tankage from Dead Animals	60
The Use of Concentrated Materials	62
Use of, in the Philippines (editorial)	50
Use of Leguminous Crops	61
Fibers:	
Baling of, by M. M. Saleeby	613
Government Exhibit at the 1911 Carnival	194
Government Maguay Exhibit at the 1911 Carnival	194
Hemp Export Duty	573
Low-grade Abacá Fiber	14
Names of Varieties of	13
Report of Committee on Abacá at the Surabaya Fiber Congress	660
Report of Committee on Agaves at the Surabaya Fiber Congress	660
Review of the Report of Fiber Expert on Java and the Surabaya Fiber Congress	659
Fiber Plants:	
Abacá—	
Climate for	299
Cultivation	302
Extraction of Fiber	304
Harvesting	303
Holing	302
Investigations	13
Lining	301
Overseeing of Harvest	304
Planting	301
Preparation of the Soil for	301
Propagation of	300
Quality of Fiber	305
Renewing of Old Plantations	306
Rootstocks for Seed	300
Selection of Varieties	299
Soil for	300
Standard Grades of Fiber	305
Yield of Fiber	305

Fiber Plants—Continued.	Page.
Distribution of Sisal Bulbils by the Philippine Railway Company	14
Maguey—	
Distribution of, by the Philippine Railway Co.	14
In Bukidnon School Garden.....	352
Manila Market for April, 1911	327
Sisal; Distribution of, by the Philippine Railway Co	14
Field Operations against Rinderpest in Bulacan and Pampanga, by Archibald R. Ward	68
First Annual Catanduanes Live-stock Exhibition..	559
Foot-and-mouth Disease:	
Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	23
In Importations of Cattle	24
Forage:	
Alfalfa	407
Australian Grasses	440
Barili	416, 449
Barnyard Millet	424
Bermuda Grass	422
Biñang Hay	441
Bonavist	406
Bureau of Agriculture Exhibit at the 1911 Carnival	195
Cassava	408
Cereals	400
Chufas	408
Classes of Fodder Used at the Serum Laboratory during the Fiscal Year 1910	27
Clover	408
Coarse Forages	400
Coconut Meal	415
Cogon Grass	440
Colorado Grass	404
Common Vetch	408
Corn-blade Fodder	416, 440, 446, 454, 456, 465, 593
Corn or Maize	401
Cowpeas	405
Crushed Feeds Used in the Philippines	443
Cultivated Forage Crops	400
Daily Feeds in Private Stables in the Philippine Islands	434
Daily Feeds in the Various Government Departments of the Philippine Islands	434
Experiments with Mixtures for	11
Flint Corns	420
Florida Beggarweed	407
Forage Crops and Forage Conditions in the Philippine Islands	394
Forage Crops from India and Other Tropical Regions	409
Forage Factory, Annual Report on	11
Forage Imported into the Philippine Islands.....	433
Forage Raising at Trinidad Stock Farm	453
Forage Tests Made by a Board of Officers of the United States Army in the Philippines.....	450

Forage—Continued.	Page.
Golden Crown Grass	403
Grains	462
Grains and Other Concentrated Feeds	419
Grasses	400
Grasses for Hay	413
Green Forages	462, 465
Guinea Grass	403, 439, 442, 447
In Bukidnon School Garden	352
Hairy Vetch	408
Hays	461
Italian Rye Grass	404, 416, 428
Japan Clover	408
Jerusalem Artichokes	409
Legumes	400
Luyaluya	416, 425
Mani-mani-an Grass	439, 442
Mayuen	402, 420
Millets	404
Miscellaneous Grasses	405
Molasses or Brazilian Grass	404
Mung or Mungo	406
Native Corn	447
Natal Grass	403, 415
Native Grasses in the Philippine Islands	435
Natural Forage Conditions in the Philippines	397
Notes on Native and Naturalized Pasture Plants	421
Oats	402
Orchard Grass	405
Palay	449, 465
Para Grass	403
Peanuts	405
Pearl Millet	402
Rhodes Grass	403, 414, 428
Root Crops	400
Seeta Bean	406
Sorghum	402
Soybeans	407
Sudan Grass	403, 415
Sugar Cane	402
Sulla	408
Sweet Potatoes	408
Taro	408
Teosinte	402
The Forage Factory of the Bureau of Agriculture	11
The Forage Problem in the Philippines (editorial)	392
The Improvement of the Natural Pasture	398
The Production of Hay in the Philippines	416
Total Area of Cogon Lands in the Philippines	397
Tunis Grass	403, 414
Various Feeds in the Philippine Islands	432
Velvet Bean	406
Yams	408
Yautia	408

	Page.
Forage Crops and Forage Conditions in the Philippines, by Charles V. Piper, Agrostologist, U. S. Department of Agriculture	394
Letter of Transmittal	394
Introduction	395
Natural Conditions in the Philippines	397
The Improvement of the Natural Pasture	398
Cultivated Forage Crops	400
Live Stock Other than Horses	409
The Outlook for Animal Husbandry	412
Horses in the Philippines	413
Grasses for Hay	413
The Production of Hay in the Philippines	416
Grains and Other Concentrated Feeds	419
Notes on Native and Naturalized Pasture Plants	421
Summary	428
Forestry:	
Bureau of Forestry Exhibit at the 1911 Carnival	198
Natural Reforestation of Grass Lands	474
Second Growth Forests in the Philippines	473
Surigao Exhibit at the 1911 Carnival	188
Formosa:	
Animal Diseases in	369
Blackleg in	370
Bovine Tuberculosis in	370
Hydrophobia in	370
Rinderpest in	369
Sugar Matters in	99
Swine Plague in	370
Forms:	
For Monthly Summary of Crop Conditions	295
For Quarterly Reports on Crops and Live Stock	33
Fruit Expert for the Bureau of Agriculture	267
Gardening on the Island of Guimaras, by F. G. Lawton	359
Garden Vegetables; Reports on, for January, 1911	144
Gartillo. (See Hemorrhagic Septicemia.)	
General Orders:	
No. 1; Importation of Cattle from Australia, Tasmania, and New Zealand	532
No. 2; Regulations Governing the Importation of Beef Animals from Australia when Designed for Slaughter	534
No. 18; In Re Animal Diseases	32
No. 19; The Disinfection of Boats and Railway Cars	109
Goats:	
Angora	490
Article on	489
Breeds Suitable for the Philippines	490
Census of, in the Philippine Islands at Beginning of Fiscal Year 1911	373
Exhibit of, at the 1911 Carnival	179
Milk Content of Albumin and Butter Fat	490
Milk from	490
Grains and Other Concentrated Feeds Used in the Philippines	419

	Page.
Grasses for Hay in the Philippines	413
Guimaras; Gardening in	359
Guinea Grass:	
At Singalong	19
In Bukidnon School Garden	352
Reports on—	
For January, 1911	144
For February and March, 1911	210
Guinea Pigs at Alabang Stock Farm	29
Hat Industry in Java	664
Hat Making:	
In Pangasinan	150
In the Philippines	681
Hawaii; Sugar Industry in	161
Hay; Production of, in the Philippines	416
Health, Bureau of; Exhibit at the 1911 Carnival	190
Hemorrhagic Septicemia; Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	23
Hemp Export Duty	573
Homesteads; Public Lands Open for, in Nueva Ecija	137
Hongkong; Infected Shipments of Cattle from	644
Horses:	
Article on	476
At Alabang Stock Farm	29
Census of, in the Philippine Islands at the Beginning of the Fiscal Year 1911	373
Conformation of Filipino Horses	479
Exhibit of, at the 1911 Carnival	177
Foreign-native Crosses at the 1911 Carnival	177
In the Philippines	413
Native and Foreign Stallions for Public Service	482
Prize Winners at the 1911 Carnival	180
Size of, in the Philippines	479
Hydrophobia in Formosa	370
Ilagan Tobacco Station; Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	20
Ilocos Norte:	
Exhibit at the 1911 Carnival	183
Extension Work Lectures in	128
Ilocos Sur:	
Cloth Exhibit at the 1911 Carnival	188
Exhibit at the 1911 Carnival	188
Extension Work Lectures in	128
Leather Exhibit at the 1911 Carnival	188
Iloilo:	
Agricultural Fair at	154
Cattle Exhibit at the Iloilo Fair	154
Cloth Exhibit at the 1911 Carnival	184
Exhibit at the 1911 Carnival	184
Exhibit of Sugar at the Iloilo Fair	154
Extension Work Lectures in	128
Leaf-hoppers on Mango Trees in	558
Rinderpest in	37

Iloilo—Continued	Page.
Silk Exhibit at the 1911 Carnival	185
Sugar Market—	
For February, 1911	221
For April, 1911	327, 387
For September, 1911	637
Iloilo Quarantine Station; Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	24
Importation of Cattle from Australia, by Archibald R. Ward	540
Imports and Exports of Animals and Animal Products for the year ending June 30, 1910	497
Imports. (See Principal Philippine Imports and Exports.)	
Increase in Government Revenue in the Philippines	267
Indian Cattle in the United States, by A. P. Borden	366
Indo-China; Antiseptic Treatment for Hevea in	216
Insects, Beneficial:	
Ichneumon Flies in Misamis	557
Parasitic Fly for Caterpillars	12
Insects, Detrimental:	
Caterpillar Attacking Mango in Cavite	313
Homoptera in Mangos in Cavite	313
Termites and their Control	653
Insular Agricultural Association:	
Duties of Officers of—	
President	253
First Vice-president	253
Secretary	253
Treasurer	254
Provincial Vice-president	254
Board of Directors	255
Fees	257
Membership	257
Name	252
Object	252
Purposes of	255
Insular Agricultural Association in the Philippines; Constitution and By-laws of	252
International Rice Congress and International Exhibition of Rice Culture and Irrigation at Vercelli, Italy	574
Irrigation:	
Along the Philippine Railway, Panay	624
In Nueva Ecija	136
Isabela; Extension Work Lectures in	128
Jamaica; Cultivation of Bananas in	98
Japan:	
Eradication of Rinderpest in	111
Institute for Animal Diseases in	115
Meat Inspection in	113
Java:	
Coffee in	662
Cotton in	661
Export of Coca from	625
Hat Industry in	664

Java—Continued	Page.
Production of Sugar in	383
Review of the Report of the Fiber Expert on Java and the Surabaya Fiber Congress	659
Rubber in	661
Sugar in	662
Jute; In Java	661
Kabaruyan Island; Rinderpest in	656
Kapok:	
In Bukidnon School Garden	354
Reports on for February and March, 1911	210
Kola; Review of Chevalier's and Em. Perrot's Book on	687
Labor:	
At Alabang Stock Farm	28
At Trinidad Garden	265
La Carlota Experiment Station:	
Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	20
Cane Beetle at	558
Cattle at	20
Moth Borers in Cane at	558
Rubber at	15
Small Red Weevil Affecting Cane at	558
La Laguna:	
Bud-rot in	151
Coconut Conditions in	151
Copra Production in	153
Rinderpest in	561
Lamiao Experiment Station:	
Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	20
Bananas at	16
Citrus Fruits at	15
Liberian Coffee at	15
Lisbon Lemon Trees at	15
Oranges at	16
Robusta Coffee at	571
Varieties of Rice at	18
Lantana Camara:	
Description of	82
Destruction of	570
In Negros	82
La Union:	
Exhibit at the Philippines Carnival	184
Extension Work Lectures in	128
Lawn Grasses in the Philippines, by C. V. Piper	537
Bermuda Grass	537
<i>Desmodium triflorum</i>	538
Korean Grass	538
Lippia	538
St. Augustine Grass	538
Weeds	539

Lawns:	Page.
Grasses Suitable for, in the Philippines.....	537
Sprays for Killing Weeds in	539
Laws; Act No. 2040 for the creation of Government Scholarships in the College of Veterinary Science, University of the Philippines	291
Legumes as Cover Crops for Rubber.....	124
Lemons; Lisbon Lemon Trees at Iamao	15
Leyte:	
Extension Work Lectures in	128
Rinderpest in	561
Library; Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	9
Live Stock:	
Animal Industry in the Philippines (editorial).....	467
At La Carlota Experiment Station	20
At the Iloilo Fair	154
At the Moro Province Fair	156
Auction at the 1911 Carnival.....	176
Breeds for Beef-cattle Raising.....	487
Breeds of Cattle Imported by the Bureau of Agriculture.....	485
Breeds for Dairy Cattle in the Philippine Islands	486
Breeds of Milch Cattle for the Philippine Islands	501
Cattle Ranches	515
Census of, in the Philippine Islands, 1911	495
Conformation of Filipino Horses	479
Exhibit at the Carnival	176
First Annual Exhibition of, in Catanduanes	559
Foot-and-mouth Disease in the Importation of	24
Foreign-native Crosses at the 1911 Carnival	178
Importation of:	
From Australia	540
Beef Animals from Australia when Designed for Slaughter (G. O. No. 2).....	534
Cattle from Australia, Tasmania, and New Zealand (G. O. No. 1)	532
Cattle into the Philippine Islands, 1908-9-10	509
Cattle from Pnum Penh	643
From Timor	646
Indian Cattle in the United States.....	366
Infected Shipments of Cattle from Hongkong	644
Judges of Exhibits at the 1911 Carnival.....	180
Mule Breeding in the Philippines.....	483
Native Cattle as a Source of Beef Supply.....	119
Native Beef Supply	506
Pleuro-pneumonia in Australia	542
Pleuro-pneumonia in Cattle from Australia	540
Report of Committee on the Beef Supply of the Philippines.....	503
Some Phases of the Problem of Importation of Cattle into the Philippines, by Archibald R. Ward.....	643
The Philippine Islands as a Grazing Country	526
The Value of Draft Animals	230
Tuberculosis in the Philippines	472

	Page.
Live Stock and Poultry in the Philippines.....	470
Introduction	470
Carabaos	487
Cattle	484
Goats	489
Horses	476
Poultry	492
Sheep	491
Swine	488
Locusts:	
A Résumé of the Locusts Situation, by David B. Mackie	344
At Alabang Stock Farm	28
Countries in which Extermination is Regulated by Law.....	346
In Ambos Camarines	44
Provinces and Towns Reporting Locusts in 1910.	346
The Locust Situation (editorial)	335
Loranthus Affecting Citrus Trees	679
Lyon Beans at Camp Vicars Potato Farm	67
Machines for Stripping Abacá	14
Maguey:	
Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	14
Baling of	613
Government Exhibit at the 1911 Carnival	194
In Bukidnon School Garden	352
Market Reports on—	
For February, 1911	221
For October, 1911	689
Mangos:	
Another Mango Pest in the Philippines, by P. J. Wester	619
Caterpillar Pest in Cavite	313
Experiments in the Propagation of	97
Homoptera in Cavite	313
Leaf-hoppers Affecting in Iloilo	558
Mally Fruit-fly Remedy	651
Mango Pests in Cavite and Rizal Provinces, by P. J. Wester	312, 681
Shield-budding	97
The Mango Web-worm in Cebu	555
Top-working Old Trees	97
Manila Quarantine; Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	24
Marinduque; Agricultural Exhibits and Expositions in	14
Market Reports:	
For December, 1910	101
For January, 1911	162
For February, 1911	219
For March, 1911	272
For April, 1911	326
For May, 1911	385
For July, 1911	577
For September, 1911	635
For October, 1911	688

Market Reports—Continued.

Page

Iloilo Sugar Market—	
For November and December, 1910, and January, 1911	164
For February, 1911	221
For March, 1911	274
For April, 1911	327, 387
For July, 1911	577
For September, 1911	637
London Fiber Market—	
For January, 1911	163
For February, 1911	220
For July, 1911	578
For September, 1911	636
Manila Fiber Market for April, 1911	327
Manila and London Fiber Market	689
For January, 1911	163
For March, 1911	272
For May, 1911	386
Manila Rice Market—	
For January, 1911	165
Matadero Inspection at Manila; Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	25
Meat Inspection in Japan	113
Mexico; Rubber Conditions in	373
Mindanao; Citrus Fruit-flies in	557
Mindoro:	
Abacá Exhibit at the 1911 Carnival	186
Exhibit at the 1911 Carnival	186
Extension Work Lectures in	128
Misamis:	
Banana-leaf Roller in	557
Exhibit at the 1911 Carnival	187
Ichneumon Flies in	557
<i>Loranthus secundiflorum</i> Infesting Citrus in	557
Miscellaneous Crops; Reports on:	
For December, 1910	90
For January, 1911	144
For March and April, 1911	262
Miscellaneous Publications; Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	9
Monthly Crop Conditions:	
Editorial on	279
Executive Order No. 13	294
For November, 1910	38
For December, 1910	86
For January, 1911	143
For February and March, 1911	209
For March and April, 1911	262
For April and May, 1911	320
For May and June, 1911	376
For June and July, 1911	563
For August and September, 1911	631
Form for Monthly Summary of	295

Monthly Veterinary Reports:	Page.
For November, 1910	37
For December, 1910	84
For January and February, 1911	139
For February and March, 1911	206
For March and April, 1911	260
For April and May, 1911	318
For May and June, 1911	374
For August and September, 1911	561, 630
For September and October, 1911	629
For October and November, 1911	684
Moro Province:	
Agricultural Exhibits and Expositions in	155
Animal Diseases in	141
Exhibit at the 1911 Carnival	188
Fishery Exhibit at the Moro Province Fair	156
Forestry and Botany Exhibits at the Moro Province Fair	156
Live-stock Exhibits at the Moro Province Fair	156
Mountain Province; Robusta Coffee Seed for	18
Mulberry; Reports on, for January, 1911	145
Mungos; Along the Philippine Railway, Panay	623
Native and Naturalized Pasture Plants in the Philippines	421
Netherlands; Regulations Relative to Laws of the Netherlands India	
Governing Importation of Cattle	371
New Coconut Pest	628
New Crop for the Philippines	625
New Director of Agriculture, The (editorial)	641
"New Ideas" in Papaya Culture	627
New Method of Controlling Termites throughout the Tropics	653
New Plants for the Philippines	625
New Theories on Soil Fertility, by O. W. Barrett	292
Notes from Other Fields:	
For April, 1911	215
For May, 1911	269
For June, 1911	380
Notes on the Baguio Experiment Station	96
Notes on Manila Market for July	577
Nueva Ecija:	
Agricultural Conditions in, by Sam H. Sherard	130
Agricultural Lands in	130
Central Luzon Agricultural School	138
Corn in	134
Extension Work Lectures in	128
Farm Animals in	132
Farm Implements in	133
Irrigation in	136
Miscellaneous Crops in	136
Principal Crops in	133
Public Lands in	137
Rice in	133
Sugar Cane in	134
Tobacco in	135
Transportation in	132

Occidental Negros:	Page.
Agricultural Exhibits and Expositions at	44
Exhibit at the 1911 Carnival	186
Extension Work Lectures in	128
Oranges:	
At Lamao	16
In Batangas	87, 94, 268
In Bukidnon School Gardens	353
Orange Tree Culture	159
Pruning	159
Oriental Negros:	
Cane Root Beetle in	557
Extension Work Lectures in	128
Rhinoceros Beetle Infesting Coconuts in	557
Rinderpest in	562, 629
Pampanga:	
Exhibit at the 1911 Carnival	185
Field Operations against Rinderpest in, Archibald R. Ward	68
Sugar Exhibit at the 1911 Carnival	185
Panay; Agriculture along the Philippine Railway, by W. A. Mace...	616
Pandacan Quarantine Station; Location of	541
Pangasinan:	
Exhibit at the 1911 Carnival	187
Extension Work Lectures in	129
Hat Exhibit at the 1911 Carnival	187
Hat Making in	150
Lectures at the Pangasinan Fair	151
Rinderpest in	139, 562, 630
The Pangasinan Fair	150
Papaya; "New Ideas" in the Culture of	627
Para Grass at Alabang Stock Farm	29
Philippine Agricultural Review; Annual Report on, for Fiscal Year 1910, by the Director of Agriculture.	8
Philippines Carnival, 1911:	
Auction of Live Stock at	176
Bohol Exhibit at	186
Bulacan Exhibit at	183
Bureau Exhibits at—	
Agriculture	193
Coconuts	195
Corn	194
Forage	195
Rice	194
Rubber	196
Tobacco	195
Education	199
Forestry	198
Health	190
Internal Revenue	197
Printing	201
Public Works	202
Science, Silk Exhibit	197
Cavite Exhibit at	183

Philippines Carnival, 1911—Continued.

	Page.
Editorial on	49
Foreign-native Cross-bred Cattle at	178
Foreign-native Cross-bred Horses at	177
Government Abacá Exhibit at	194
Government Exhibits at	190
Government Fiber Exhibit at	194
Government Maguey Exhibit at	194
Government Rice Exhibit at	192
Ilocos Norte Cloth Exhibit at	183
Ilocos Norte Exhibit at	183
Ilocos Sur Cloth Exhibit at	188
Ilocos Sur Exhibit at	188
Ilocos Sur Leather Exhibit at	188
Iloilo Exhibit at	184
Iloilo Cloth Exhibit at	184
Iloilo Silk Exhibit at	185
Imported Dairy Cattle at	178
Judges of the Live-stock Exhibit at	180
La Union Exhibit at	184
List of Prize Winners	180
Carabaos	180
Cattle	180
Horses	180
Poultry and Pigeons	181
Swine	181
Live-stock Exhibit at	176
Mindoro Abacá Exhibit at	186
Mindoro Exhibit at	186
Misamis Exhibit at	187
Moro Province Exhibit at	188
Nellore Cattle at	178
Occidental Negros Exhibit at	185
Pampanga Exhibit at	185
Pampanga Sugar Exhibit at	185
Panay Silk Exhibit at	185
Pangasinan Exhibit at	187
Pangasinan Hat Exhibit at	187
Prize Winners in Provincial Exhibits	189
Program for Conferences of Industrial Teachers Accompanying the 1911 Carnival Exhibits	279
Provincial Exhibits at	182
Samar Exhibit at	182
Second Annual Live-stock Exhibit at	176
Carabao Division	173
Cattle Division	177
Goat Division	179
Horse Division	177
Poultry Division	179
Swine Division	178
Surigao Exhibit at	188
Surigao Forestry Exhibit at	188

Philippines Carnival, 1911—Continued.	Page.
Tarlac Exhibit at	184
The Carnival as a Factor in Agricultural Development (editorial)	174
The Review and the Carnival (editorial)	174
Philippines at San Francisco	572
Philippine Hard Woods	572
Philippine Veterinary Medical Association:	
Address of Welcome Delivered at the Third Annual Meeting of....	230
Response by the Director of Agriculture to Address of Welcome Delivered at the Third Annual Meeting of	234
Resolution Passed at Third Annual Meeting of....	242
Third Annual Meeting of, by Dr. David C. Kretzer	238
Pineapples:	
In Bukidnon School Garden	352
As a Catch Crop for Rubber	382
Plant Investigations; Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	18
Plant Pests and Diseases:	
A New Coconut Pest	628
Another Mango Pest in the Philippines, by P. J. Wester	649
Bag-worm Infesting Bananas in Cebu	556
Banana Diseases	95
Banana-leaf Roller in Misamis	557
Brown Root Rot Disease of Rubber	647
Bud-rot in Laguna	151
Cane-root Beetle at the La Carlota Experiment Station	558
Cane-root Beetle in Oriental Negros	557
Carbon Bisulphide as a Fumigant for the Tobacco Beetle	611
Caterpillars Attacking Mangos in Cavite	313
Caterpillars in Batangas	12
Citrus Fruit-flies in Mindanao	557
Corn-leaf Blight in the Philippines, by C. B. Robinson	356
Countries in which Locust Extermination is Regulated by Law	346
Crop Pests, Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	11
Dieback of Rubber	648
Fomes Disease of Rubber	648
Formaldehyde as a Fumigant for the Tobacco Beetle	611
Homoptera in Mangos in Cavite	313
Hydrocyanic Acid Gas as a Fumigant for the Tobacco Beetle	610
In Cebu	555
Leaf-hoppers on Mangos in Iloilo	558
Lepidoptera Infesting Pomelo Trees in Cebu	556
Locusts—	
A Résumé of the Locust Situation, by David B. Mackie	344
Provinces and Towns Reporting Locusts in 1910	346
The Locust Situation (editorial)	335
Loranthus Affecting Citrus Trees	679
<i>Lo:anthus secundiflorum</i> in Misamis	557
Mally Fruit-fly Remedy	651
Mango Pests in Cavite and Rizal, by P. J. Wester	312, 681

Plant Pests and Diseases—Continued.		Page.
Moth Borers in Cane at La Carlota Experiment Station		558
Pink Fungus of Rubber		648
Rhinoceros Beetle Infesting Coconuts in Oriental Negros		557
Small Red Weevil Affecting Cane at La Carlota Experiment Station		558
The Mango Web-worm in Cebu		555
The Tobacco Beetle (editorial)		590
The Tobacco Beetle and a Method for its Control, by D. B. Mackie		606
Warnings to Rubber Planters, by O. W. Barrett		647
Plants, Detrimental; "Lantana Camara" in Negros		82
Pleuro-pneumonia:		
In Cattle in Australia		542
In Cattle from Australia		540
Pnum Penh; Importation of Cattle from		643
Pop Corn in the Philippines		683
Potatoes:		
Seed Used at Camp Vicars Potato Farm		66
The Camp Vicars Potato Farm, By O. W. Barrett		65
Poultry:		
Article on		492
Care of Young Chicks		78
Diseases of		79
Anæmia		79
Apoplexy		79
Bronchitis		79
Dysentery or Diarrhœa		80
Enlarged Liver		80
Flavus or White Comb		80
Gapes		80
Roup or Contagious Catarrh		81
Warts or Chicken Pox		81
Egg Production		74
Exhibit of, at the 1911 Carnival		179
Feeding the Laying Stock		78
Incubators		77
Prize Winners at the 1911 Carnival		181
Runs and Types of Houses		76
Selection of Hens		75
Selection of Stock		74
Some Suggestions for Poultry Raisers in the Philippines, by George Seaver		74
Practicability of Supplying Native Beef to the Army, by G. E. Nesom		119
Principal Crops Grown at Alabang Stock Farm		28
Principal Philippine Imports and Exports:		
Distribution of Exports for the Four Months January to April, 1911		326
Distribution of Exports for the 7 months from January to July, 1911		577
Distribution of Exports for the Quarter Ending March 31, 1911..		272
For November, 1910		102

Principal Philippine Imports and Exports—Continued.		Page.
For December, 1910		166
For January, 1911		167
For February, 1911		222
For March, 1911		275
For April, 1911		388
For May, 1911		581
For June, 1911		582
For July, 1911		582
For August, 1911		639
For September, 1911		690
Printing, Bureau of; Exhibit at the 1911 Carnival		201
Production of Sugar in Java		383
Pruning for Orange Trees		159
Publications; Annual Report on, for Fiscal Year 1910, by the Director of Agriculture		8
Public Lands in Nueva Ecija		137
Public Works, Bureau of; Exhibit at the Philippines Carnival		202
Quarantine Service; Annual Report on, for Fiscal Year 1910, by the Director of Agriculture		23
Quarantine Stations; Pandacan, Location of		541
Queensland; The Sugar Industry in.		217
Rabbits at Alabang Stock Farm		29
Rainfall; Notes on Monthly Rainfall		475
Range of Prices of Philippine Agricultural Products:		
For the Months of—		
July, 1910		45
August, 1910		46
For the Quarter Ending—		
September 30, 1910		172
December 31, 1910		331
March 31, 1911		586
Regulations for Dealing in Copra in Samoa		628
Regulation Relative to Laws of the Netherlands India Governing Importation of Cattle		371
Report of the Director of Agriculture for the Fiscal Year Ending June 30, 1910		7-31
Report on the Recent Outbreak of Rinderpest in the District of Davao, Mindanao, by Dr. C. G. Thomson		243
Report on Tobacco on the Island of Cebu, by R. W. Rowe		315
Résumé of the Locust Situation, by David B. Mackie		344
Review of the Report of the Fiber Expert on Java and the Surabaya Fiber Congress		659
Review of the Scope and Methods of Tropical Veterinary Entomo- logy, by M. B. Mitzmain		666
Rice:		
Along the Philippine Railway, Panay		618
Annual Report on, for Fiscal Year 1910, by the Director of Agriculture		18
Bureau of Agriculture Exhibit at the 1911 Carnival		194
Government Exhibit at the 1911 Carnival		192
In Ambos Camarines		39
In Ilocos Norte		38

Rice—Continued.

	Page.
In Nueva Ecija	133
International Rice Congress at Vercelli, Italy	574
Manila Rice Market for January, 1911	165
Monthly Crop Conditions for May and June, 1911	377
Range of Prices. (<i>See</i> Range of Prices of Philippine Agricultural Products.)	
Reports on—	
For December, 1910	87
For January, 1911	145
For February and March, 1911	210
For March and April, 1911	262
For April and May, 1911	322
For June and July, 1911	567
For August and September, 1911	633
Rice Famine (editorial)	530
Statistics Regarding the Growing of, in the Philippine Islands, Fiscal Year 1910	248
Varieties—	
At Alabang	18
At Lamao	18
Rice Ally Crops, By O. W. Barrett:	
Beans	598
Cassava	598
Cowpeas	598
Maize	592
Peanuts	598
Sorghum	596
Soy Beans	594
Taro	598
Yams	598
Yautias	598
Rinderpest:	
Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	21
Appropriate and Practical Methods in Dealing with	239
Constabulary Soldiers for Use in Control Work	22
Declaration and Quarantine Order Regarding, in certain Provinces	229
Editorial on	51
Efficiency of Scouts as Quarantine Guards in Davao, 1910 Outbreak	247
Eradication of, in Japan	111
Factors Contributing to Suppression of, in Davao	247
Field Methods of Combating, Special Order No. 10	69
Field Operations against, in Bulacan and Pampanga, by Archibald R. Ward	68
Hogs as Carriers of	241
In Bataan	561, 629
In Bulacan	561
In Cagayan	561, 629
In Cebu	561

Rinderpest—Continued.

	Page.
Infected Area in Davao, 1910 Outbreak	245
In Formosa	369
In Iloilo	37
In Importations of Cattle	24
In La Laguna	561
In Leyte	561
In Oriental Negros	562, 629
In Pampanga	562
In Pangasinan	562, 630
In Rizal	562
In Tarlac	562, 630
In Zambales	562, 630
Monthly Veterinary Reports on—	
For February and March, 1911	206
For March and April, 1911	260
For April and May, 1911	318
For May and June, 1911	374
For August and September 1911	261
For September and October 1911	629
For October and November 1911	684
Necessity of Adoption of Rigid Measures for the Suppression of	240
Number of Animals Slaughtered in 1910 Davao Outbreak	246
On Kabaruyan Island	656
Production of Serum in Japan	116
Report on the Recent Outbreak of, in the District of Davao, Mindanao, by Dr. C. G. Thomson	243
Scouts as Quarantine Guards	341
Scouts as Quarantine Guards in Davao	244
Slaughter of Infected Animals in Davao, 1910 Outbreak	246
Source of Infection, 1910 Davao Rinderpest Outbreak	247
The Rinderpest Campaign (editorial)	51
The Rinderpest Problem, article by Archibald R. Ward, Chief Veterinarian	337
The Rinderpest Problem (editorial)	333
The Rinderpest Situation and the People (editorial)	225
Total Loss of Animals in Davao, 1910 Outbreak	246
Use of Serum in Japan	111
Rizal:	
Mango Pest in	312, 681
Rinderpest in	562
Roselle	573
Rubber:	
Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	15
Antiseptic Treatment for Hevea in Indo-China	216
At La Carlota Experiment Station	15
At Singalong Experiment Station	15
Brown Root Rot Disease	647
Bureau of Agriculture Exhibit at the 1911 Carnival	196
Ceará, at La Carlota Experiment Station	15
Conditions of, in Mexico	383

Rubber—Continued.

	Page.
Cover Crops for Use with Rubber	124
Cultural Directions for Young Pará Rubber. Extension Work	
Circular No. 3, by O. W. Barrett	122
Cultivation	123
Holes	123
Planting	122
Removal from Seedbed	122
Dieback	648
Estimated Cost of Laying Out a Rubber Estate	380
Fomes Disease	648
Hevea in Cochin China	269
In Bukidnon School Garden	353
In Java	661
Investigations	15
Legumes as Cover Crops for	124
Maize as a Catch Crop for	160
Mulches for Rubber Trees	124
Packing of Seed for Shipment	648
Pineapples as a Catch Crop for	382
Pink Fungus	648
Reports on—	
For November, 1910	43
For December, 1910	89
For January, 1911	147
Rubber and Cacao	215
Rubber Conditions in Mexico	383
Rubber Planters Association in Cochin China	269
Tapping Castilla Rubber	98
Warnings to Rubber Planters, by O. W. Barrett	647
Samar Exhibit at the 1911 Carnival	182
Samoa:	
Agricultural and Trade Conditions in, for 1909	381
Regulations for Dealing in Copra in	628
San Lázaro Immunizing Station; Annual Report on, for Fiscal Year	
1910, by the Director of Agriculture	25
School Farming in Bukidnon, by Lewis S. Thomas	349
School Gardens in Antique	157
Science, Bureau of; Exhibit at the 1911 Carnival	197
Seed Distribution; Annual Report on, for Fiscal Year 1910, by the	
Director of Agriculture	18
Sensitive Plant	570
Sericulture in the Philippines	682
Serum:	
Intraperitoneal Method of Injecting	26
Production of in Japan	116
Production of Peritoneal Fluid	26
Total Production of, for 1910	26
Types of Animals Used in the Production of	26
Use of, in Japan	111
Various Serums Manufactured in Japan	115
Serum Laboratory; Annual Report on, for Fiscal Year 1910, by the	
Director of Agriculture	25

Sheep:	Page.
Article on	491
Breeds Suitable for the Philippine Islands	492
Census of, in the Philippine Islands at Beginning of Fiscal Year 1911	373
Mutton Imported in the Philippines	492
Origin of the Sheep in the Philippines	491
Silk:	
Bureau of Science Exhibit at the 1911 Carnival	197
Iloilo Exhibit at the 1911 Carnival	185
Singalong Experiment Station:	
Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	19
Avocado Pears at	16
Corn at	17
Maragogepe Coffee at	15
Sisal:	
Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	14
Distribution of Bulbils by the Philippine Railway Company	14
Market Reports on—	
For February, 1911	221
For October, 1911	689
Sisiman Matadero, Location of	543
Slaughterhouses in Japan	113
Soils:	
Along the Philippine Railway, Panay	616
At Camp Vicars Potato Farm	66
Bacteria for Inoculation of	293
Directions for Taking Soil Samples	92
In Cebu	315
Inoculation of	95
New Theories on the Fertility of by O. W. Barrett	292
Some Notes on Agricultural Pests, by D. B. Mackie	555
Some Phases of the Problem of Importation of Cattle into the Philippines, by Archibald R. Ward	643
Some Suggestions for Poultry Raisers in the Philippines, by George Seaver	74
Sorghum at Alabang Stock Farm	29
Sorsogon; Extension Work Lectures in	129
Soybeans; Preparations Made from, in Japan	594
Special Orders; No. 10, Field Methods of Combating Rinderpest	69
Statistics:	
Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	10
On Coconuts in the Philippines, Fiscal Year 1910	364
On Corn in the Philippines, Fiscal Year 1910	362
On Hemp in the Philippines, Fiscal Year 1910	250
On Sugar Cane in the Philippines, Fiscal Year 1910	308
On Tobacco in the Philippines, Fiscal Year 1910	310
Regarding the Growing of Rice in the Philippine Islands, Fiscal Year 1910	248
Statistical Maps, on Philippine Crops (editorial).	228

	Page.
St. Kitts; Central Sugar Factory in.....	383
Sugar:	
Central Sugar Factory in St. Kitts	383
Conditions in British East Indies	215
From Dried Cane	100
Iloilo Sugar Market—	
For November and December, 1910, and January, 1911.....	164
For February, 1911	221
For March, 1911	274
For April, 1911	327, 387
For July, 1911	577
For September, 1911	637
In Java	662
Market Reports on—	
For January, 1911	162
For February, 1911	219
For March, 1911	272
For April, 1911	326
For May, 1911	385
For September, 1911	635
For October, 1911	688
Modern Sugar Mills in China	269
Pampanga Exhibit at the 1911 Carnival	185
Production of, in Java	383
Range of Prices. (See Range of Prices of Philippine Agricultural Products.)	
Sugar Exhibits at the Iloilo Fair	154
Sugar Industry in Cuba	271
Sugar Matters in Formosa	99
The Sugar Industry in Hawaii	161
In Queensland	217
Sugar Cane:	
Along the Philippine Railway, Panay	620
At Alabang Stock Farm	29
At La Carlota Experiment Station	20
Cane-root Beetle at La Carlota Experiment Station.....	558
Cane-root Beetle in Oriental Negros	557
In Bukidnon School Garden	352
In Nueva Ecija	134
Moth Borers in, at La Carlota Experiment Station.....	558
Reports on—	
For November, 1910	41
For December, 1910	89
For January, 1911	147
For February and March, 1911	212
For March and April, 1911	263
For April and May, 1911	323
For May and June, 1911	378
For June and July, 1911	568
For August and September, 1911	634
Small Red Weevil Affecting, at La Carlota Experiment Station..	558
Statistics Regarding, in the Philippine Islands, Fiscal Year 1910..	308

	Page.
Surabaya; Review of the Report of the Fiber Expert on Java and the Surabaya Fiber Congress	659
Surigao:	
Exhibit at the 1911 Carnival.....	188
Forestry Exhibit at the 1911 Carnival.....	188
Surra:	
Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	22
At Alabang Stock Farm	29
Experiments by the Bureau of Science in Finding a Cure for.....	23
Swine:	
Article on	488
At Alabang Stock Farm	29
Census of, in the Philippine Islands at Beginning of Fiscal Year 1911	373
Exhibit of, at the 1911 Carnival	178
Prize Winners at the 1911 Carnival	181
Swine Plague in Formosa	370
Tarlac:	
Exhibit at the 1911 Carnival	184
Rinderpest in	562, 630
Tea in Java	664
Temperature and Rainfall for Agricultural Districts in the Philippines:	
For November, 1910	47
For December, 1910	103
For January, 1911	168
For February, 1911	223
For March, 1911	276
For April, 1911	332
For May, 1911	389
For June and July, 1911	587
For August, 1911	640
For September, 1911	691
Termites; New Method of Controlling Termites throughout the Tropics	653
The Philippines as a Grazing Country.	526
The Propagation of the Avocado, by P. J. Wester.....	599
The Rinderpest Problem, by Archibald R. Ward, Chief Veterinarian..	337
The Tobacco Beetle and a Method for its Control, by D. V. Mackie	606
Third Annual Meeting of the Philippine Veterinary Medical Association, Manila, February 25 and 27, 1911, by Dr. David C. Kretzer..	238
Timor:	
<i>Bos Banteng</i> from	646
Importation of Live Stock from	646
Tobacco:	
Along the Philippine Railway, Panay	621
Bureau of Agriculture Exhibit at the 1911 Carnival.....	195
Carbon Bisulphide as a Fumigant for the Tobacco Beetle.....	611
Cultivation of, in Cebu	316
Description of Leaf Grown in Cebu	315
Formaldehyde as a Fumigant for the Tobacco Beetle.....	611

Tabacco—Continued.

	Page.
Hydrocyanic Acid Gas as a Fumigant for the Tobacco Beetle.....	610
Ilagan Tobacco Station	20
In Bukidnon School Garden	354
In Nueva Ecija	135
Method of Curing in Cebu	317
Planting Season in Cebu	316
Range of Prices. (See Range of Prices of Philippine Agricultural Products.)	
Reports on by Governors—	
For November, 1910	42
For December, 1910	89
For January, 1911	149
For February and March, 1911	213
For March and April, 1911	263
For April and May, 1911	324
For May and June, 1911	379
For June and July, 1911	569
Report on, in the Island of Cebu, by R. W. Rowe ..	315
Seed Cleaning	678
Statistics Regarding, in the Philippine Islands, Fiscal Year 1910	310
The Tobacco Beetle (editorial) ..	590
The Tobacco Beetle and a Method for its Control, by D. B. Mackie ..	606
Topography and Soil in the Philippines	476
Trinidad Garden	265
Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	19
Area	265
Climate at	265
Elevation	265
Labor at	265
Vegetables at	265
Trinidad Stock Farm:	
Annual Report on, for Fiscal Year 1910, by the Director of Agriculture	30
Breeding of Horses at	30
Forage Raising at	453
Hindu Cattle at	31
Live Stock at	30
Tropical Fruits in the Visayas, by P. J. Wester	545
Tuberculosis, Bovine, in Formosa	370
Tuberculosis in the Philippines	472
University of the Philippines:	
College of Veterinary Science, by Alvin Broerman, D. V. M. ..	288
Government Scholarships in the College of Veterinary Science ..	291
Vanilla Growing in the Philippines	682
Vegetables:	
At Trinidad Garden	19, 265
Vegetable Gardens in the Philippines (editorial) ..	334

	Page.
Veterinary Institutions of Japan (editorial)	106
Institute for the Infectious Diseases of Animals	115
Organization	111
Quarantine Stations	113
Report on, by R. F. Knight and C. G. Thomson	111
Rinderpest Eradication	111
Slaughterhouses and Meat Inspection	113
Veterinary Instruction	117
Veterinary Science, College of, University of the Philippines:	
Article on, by Alvin Broerman, D. V. M.	288
Government Scholarships in	291
Warnings to Rubber Planters, by O. W. Barrett	647
Zambales; Rinderpest in	562, 630
Zamboanga; Moro Province Fair at	155

A U T H O R S .

	Page
BARRETT, O. W.:	
A Dangerous New Weed in the Philippines	82
Book Reviews—	
Cacao	686
<i>Les Kolatiers et Les Noix De Kola</i>	687
"Notes on the Soil and Plant Sanitation of Cacao and Rubber Estates," by Harold Smith	576
Coconut Conditions in La Laguna	151
Cultural Directions for Young Pará Rubber, Extension Work Circular No. 3	122
New Theories on Soil Fertility	292
Rice Ally Crops	592
The Camp Vicars Potato Farm	65
Warnings to Rubber Planters	647
BORDEN, A. P.; Indian Cattle in the United States	366
BROERMAN, DR. ALVIN; The College of Veterinary Science, University of the Philippines	288
CODDINGTON, E. A.; The Provincial Exhibits at the Carnival	182
CONNER, C. M.; Fertilizers	53
DECKER, DR. CHAS. H.; Rinderpest on Kabaruyan Island	656
EDWARDS, C. W.; The Second Annual Live-stock Exhibit at the 1911 Carnival	176
EDWARDS, H. T.; Bureau of Agriculture Extension Work Lectures	126
FISKE, R. J.; Review of the Report of the Fiber Expert on Java and the Surabaya Fiber Congress	659
GEARHART, F. C.; The First Annual Catanduanes Live-stock Exhibition	559
HOBART, W. D.:	
Statistics Regarding Corn and Coconuts in the Philippines	362
Statistics Regarding Rice and Hemp in the Philippines	248
Statistics Regarding Sugar Cane and Tobacco in the Philippines	308
KNIGHT, R. F., and Thomson, C. G.; Brief Report on the Veterinary Institutions of Japan	111
KRETZER, DR. DAVID C.; The Third Annual Meeting of the Philippine Veterinary Medical Association, Manila, February 25 to 27, 1911	238
LAWTON, F. G.; Gardening on the Island of Guimaras	359
MACE, W. A.; Agriculture along the Philippine Railway, Panay	616
MACKIE, D. B.:	
A New Method of Controlling Termites	653
A Résumé of the Locust Situation	344
Some Notes on Agricultural Pests	555
The Tobacco Beetle and a Method for its Control	606
MITZMAIN, M. B.; A Review of the Scope and Methods of Tropical Veterinary Entomology	666

	Page.
NESOM, Dr. G. E.; The Practicability of Supplying Native Beef to the Army	119
O'CONNER, FRANCIS W.; Animal Diseases in Formosa	369
PIPER, CHAS. V.:	
Forage Crops and Forage Conditions in the Philippines	394
Lawn Grasses in the Philippines	537
The Development of Philippine Agriculture	280
ROBINSON, C. B.; Corn-leaf Blight in the Philippines	356
ROWE, R. W.; Report on Tobacco Growing in the Island of Cebu	315
SALLEEY, M. M.:	
Abacá (Manila Hemp), Agricultural Extension Work Lecture No. 3	298
Baling of Fibers	613
SEAYER, GEORGE; Some Suggestions for Poultry Raisers in the Philippines	74
SHERARD, SAM. H.; Agricultural Conditions in the Province of Nueva Ecija	130
THOMAS, LEWIS S.; School Farming in Bukidnon	349
THOMSON, C. G.; Report on the Recent Outbreak of Rinderpest in the District of Davao, Mindanao	243
THOMSON, C. G., and KNIGHT, R. F.; Brief Report on the Veterinary Institutions of Japan	111
WARD, ARCHIBALD R.:	
Field Operations against Rinderpest in the Provinces of Bulacan and Pampanga	68
Monthly Veterinary Reports—October and November	684
Some Phases of the Problem of Importation of Cattle into the Philippines	643
The Importation of Cattle from Australia	540
The Rinderpest Problem	337
WESTER, P. J.:	
Another Mango Pest in the Philippines	649
Mango Pests in Cavite and Rizal Provinces	312
The Propagation of the Avocado	599
Tropical Fruits in the Visayas	545

ILLUSTRATIONS.

Abacá:	Page
(a) Maguindanao and tangoñgon varieties (b), Libuton variety	12
(a) Sinaba and tangoñgon varieties, (b) Baguisanon lawaan variety	14
Avocados grown at Singalong Experiment Station	18
Banana Leaf Attacked by Banana-leaf Roller (<i>Erionota thrax</i>)	558
Barns at the Trinidad Stock Farm	1
Beggarweed (on right) and Rhodes Grass (on left), two-thirds grown, at Alabang Stock Farm	406
Budded Avocado in the Orchard, Miami, Florida	589
Bureau of Agriculture exhibit of corn, coconuts, vegetables, and fruits	192
Bureau of Agriculture exhibit of forage, vegetables, and cacao	194
Cane Root Beetle; (a) Larva of Cane Root Beetle (<i>Holotrichia vidua</i> Sharp); (b) Cane Root Beetle (<i>Holotrichia vidua</i> Sharp)	554
Carnival; (a) General view of buildings for the live-stock exhibit at the 1911 Carnival; (b) Poultry exhibit at the Carnival	176
Case used in Fumigation Experiments with the Tobacco Beetle	610
Cigars Attacked by Tobacco Beetle	620
Coat of Arms of the Philippine Islands made from different varieties of rice raised in the Philippines	173
Coconut Dryer used in La Laguna Province	150
Cowpeas, Lamao Experiment Station	428
Directions for taking soil samples represented graphically	93
Dwarf Coconut Tree, Misamis, Mindanao	529
Fiber exhibit of the Bureau of Agriculture	196
Field of upland rice at Lamao Experiment Station	38
Forage Beans, three months old, Singalong Experiment Station	460
Fruits; (a) "Samuyáo" (<i>Citrus</i> sp.), (b) "Pangi" (<i>Mangifera</i> sp)	548
Guinea Grass, Singalong Experiment Station	438
Harvesting Zacate near Manila	391
Imported Nellore Cow	486
Interior view of the forage factory at Pandacan, Manila	10
Liberian coffee tree at Lamao Experiment Station	16
Lisbon lemons grown at Lamao Experiment Station	16
Live Stock:	
(a) Exhibit of two-year-old Nellore bulls sold at public auction by the Bureau of Agriculture; (b) Galloway-Chinese three-year-old bull	180
(a) Mestizo stallions bred by the Bureau of Agriculture; (b) Arab-native mestizo stallion "Beder Junior"	178
(a) Native bull; (b) Native bull; (c) Imported Chinese bullock; (d) Cross-bred bull	484

Live Stock—Continued.	Page.
(a) Native carabao; (b) Imported Indo-China carabao	488
(a) Native sheeps and goats; (b) Native swine	492
(a) Native stallion; (b) Crossbred colt	476
(a) Native stallion; (b) Native Mare	467
Map showing the development of the Coconut Industry in the Phil- ippines	365
Map showing the development of the Corn Industry in the Phil- ippines	368
Map showing the development of the Hemp-growing Industry in the Philippines	251
Map showing the development of the Rice-growing Industry in the Philippines	249
Map showing the development of the Sugar Industry in the Phil- ippines	309
Map showing the development of the Tobacco Industry in the Phil- ippines	311
Mexican Fruit-fly (<i>Trypeta ludens</i> Loew)	652
Native Coconut-oil Mill used in La Laguna Province.....	152
Potatoes grown at the Camp Vicars Potato Farm	66
Pot-grown, Budded Avocado	600
Pump, Fume Chest, etc., used for Destroying Termites.....	655
Quarantine Station used for the Detention of Imported Animals at Yokohama	105
Rainfall Map	524
Shield-budding the Avocado; (a) Rejected budstick; (b) Ideal Bud- wood; (c) Bud Inserted before tying; (d) Bud	604
"Suá" (<i>Citrus</i> sp.).....	544
The Camp Vicars Potato Farm	49
Thrashing out rice at Lamao Experiment Station	40
Timor Cattle	646
Timor Cow	641
Tobacco Beetle (<i>Lasioderma serricorne</i>); (a) Larva; (b) Pupa; (c) Mature Beetle; (d) Side view; (e) Antenna	612



PLATF I - BARNES AT THE TRINIDAD STOCK FARM

THE PHILIPPINE *Agricultural Review*

VOL. IV

JANUARY, 1911.

No. 1

CONTENTS AND ILLUSTRATIONS.

1-OCT. 1911

CONTENTS.

Editorial	7
Report of the Director of Agriculture for the fiscal year ending June 30, 1910.....	7
General Order No. 18	32
Form used for quarterly crop reports	33
Monthly veterinary reports	37
Monthly crop reports	38
Current notes	44
Range of prices of Philippine agricultural products for July and August, 1910.....	45
Temperature and rainfall for November, 1910, by the Director of the Weather Bureau	47

ILLUSTRATIONS.

PLATE I. Barns at the Trinidad stock farm	Frontispiece.
	Facing page—
II. Interior view of the forage factory at Pandacan, Manila.....	10
III. Abacá: (a) Maguindanao and tangoigon varieties. (b) Libuton variety	12
IV. Abacá: (a) Sinaba and tangoigon varieties. (b) Baguisanon lawaan variety	14
V. Liberian coffee tree at Lamao experiment station	16
VI. Lisbon lemons grown at Lamao experiment station.....	16
VII. Avocado pears grown at Singalong experiment station	18
VIII. Field of upland rice at Lamao experiment station	38
IX. Threshing out rice at Lamao experiment station	40

EDITORIAL.

A CONSERVATION POLICY FOR THE PHILIPPINES.

The conservation of natural resources is a subject that is engaging the attention of many of the leading thinkers of the world to-day. There are many different views as to what constitutes a proper policy for the conservation of natural resources.

In general, however, such a policy consists in the formation and execution of plans by means of which the natural resources of a country shall be so developed and used that they may continue to benefit the people for a long period, instead of being unnecessarily wasted or entirely destroyed by the present gen-

eration. This policy takes into account the general principle that the natural resources of any country are the heritage of the people who live in that country, and who are entitled to the legitimate use of these resources at any given time. No single generation, nor any small number of generations, have any right to so use the natural wealth of a country as to destroy it for future generations, but each generation owes it as a duty to posterity to so preserve these natural resources that they will be of equal, or increasing, benefit to all generations in perpetuity.

The Philippine Islands have not been represented at the different conservation meetings held in the United States, and have never had a conservation committee, as was suggested in the September number, 1909, of the REVIEW. The existing legislation pertaining to many of the natural resources of these Islands shows, however, that a distinctly advanced line of thought on this subject has influenced those who have regulated by law the use of the natural resources of the Philippines. The conservation of mineral and forest products is fairly well assured under our present laws, and the better use of the irrigation waters through a system of Government irrigation projects has been undertaken. There exists, also, legislation to prevent the exploitation of the agricultural lands of the Islands by prohibiting their acquirement in large quantities by concerns having a monopolistic tendency, and offering them in small bodies as homesteads to all people of the country who desire to take them. There is in the conservation ideas of existing legislation a very strong current which tends to conserve these resources by prohibiting their use rather than encouraging their development at the present time, or increasing their value for future generations. This, however, may properly be considered a desirable, rather than an undesirable, feature of the existing laws, as it has effectually prevented exploitation in almost every line, and now that the defects in existing laws, which are preventing the legitimate use of our natural resources, are becoming evident there will no doubt be a tendency to correct such defects as the years go by. There is not, and can not be, any reasonable objection to the use of natural resources if they are not destroyed or lessened in value; while, on the other hand, their development and use should by all means be encouraged when their value is thereby enhanced for future generations.

Conditions in the Philippine Islands, at the present time, are in many respects similar to those in sparsely settled coun-

tries like Argentina, South Africa, Australia, and the southwestern portion of the United States, in that there exists in these Islands a great abundance of natural resources, a large part of which are not being used. There are, however, many portions of the Philippines where the bounties of nature have been drawn upon so freely that they have been exhausted without any great benefit to those who have used them. This is particularly true in the cutting away of forests near the centers of greatest density of population, and in the mountain districts where the nomadic tribes are continually engaged in clearing spots of land (*caingin*) for planting mountain rice. These simple people do not realize that they are cutting away hundreds of pesos worth of timber in order that they may grow a few pesos worth of rice, only to abandon the land and allow it to grow up in grass, the annual burning of which prevents reforestation.

The five great classes of natural resources of the Philippines—the forests, the mines, the inland waters, the fisheries, and the soil—are performing their natural functions of supplying the population with the primary necessities of life in that abundant but spasmodic way so noticeable in the Tropics. The population of the Philippine Islands, which now numbers nearly 8,000,000, draw from field, forest, stream, and coastal waters all of the necessities of life and some of the luxuries. If each inhabitant uses products obtained from these sources having a value of only ₱50 per annum, the value of the products thus consumed would be ₱400,000,000. Besides this there is an export trade, coming almost entirely from the soil, and amounting to ₱80,000,000.

The forests of the Philippines produce annually a product valued at about ₱6,000,000 and the mineral resources contribute to our products about two and a quarter million pesos. These figures represent only a small fraction of the possibilities of nature's bounties in the Philippines under a modern system of development with conservation.

The Philippines contain a total area of 29,791,734 hectares¹ of which approximately 10,000,000 hectares are in virgin forests, 1,300,000 hectares in cultivated lands, and 18,500,000 hectares in second-growth timber and unused land. Almost all of the latter class is unoccupied public domain covered with a growth of cogon grass, scrub, and noncommercial forests, as a result of deforestation by the cutting of timber, the clearing of small plats for rice growing, and the subsequent ravages of fire.

¹ Census of the Philippine Islands, 1903.

The mineral lands are already attracting the attention of miners and the forest resources are slowly being developed, but thus far the greatest natural wealth of the Philippines, consisting of its unoccupied lands, has received practically no attention. It is to this resource more particularly that we desire to direct attention. One who is not familiar with the Tropics probably does not realize the wonderful growth of vegetation which takes place during the rainy season and the fearful consequences from fires during the dry season, when the grass and weeds have died down and dried so as to become a ready fuel when touched by the drip of pitch torches or a spark from a nomadic camp fire. From the standpoint of grazing, however, these lands are really more useful during the dry season than when rain is abundant and the growth is rank and coarse. With the great abundance of land of this class in almost every province of the Philippines, and almost entirely covering some islands in the sparsely populated sections, the Archipelago can justly lay claim to being one of the best natural grazing countries in the world.

In Spanish times and before the advent of rinderpest, grazing was a great industry in the Islands, and so abundant was the supply of cattle and carabaos that the price for such animals was very low, but with the introduction of rinderpest into the country a large part of the cattle and carabaos were destroyed. The insurrection followed and the restoration of peace required more than five years, during which time there was a general decline in Philippine agriculture and the cattle industry of the Islands almost ceased to exist. The latter can never be successfully restored on a large commercial scale until such time as rinderpest and surra are completely eradicated in these Islands, but when that time comes there is not a shadow of doubt that the great extent of territory, constituting one of our most valuable natural resources, will again be dotted everywhere with herds of cattle, carabaos, and horses.

The possibilities in this direction are almost unlimited both as to the direct value of product and from the standpoint of Government revenue. If only half of the unused lands of the Islands are considered suitable for grazing purposes and one hectare is allowed for the sustenance of each animal, the country would support herds aggregating nine million head, having a value of not less than ₱600,000,000. The present number of animals in the Islands probably does not exceed 1,000,000, and there is an annual importation of about 50,000 head of cattle, used principally for slaughter, and meat products equivalent to another

50,000 head are imported each year. The total annual expenditure for these animals and animal products, which could be produced in the Philippines, is from ₱6,000,000 to ₱8,000,000.

The most valuable feature of conservation for the Philippines would be to put into use as large an area as possible of these unoccupied lands for grazing purposes after the total eradication of animal diseases, thereby making the business reasonably safe with the assurance of abundant profits. The land should not be sold but leased for a reasonable period in areas of such size as would be sufficient for all of the animals which any person or firm desired to maintain. The terms of the lease might be the same as the present lease of public domain, but probably a better arrangement for both the ranchers and the Government would be to mark out a territory to be occupied by each lessee and use a system of charges per head per animal. The stock raiser would then have to pay only for the animals grazed and as the herds grow larger year by year the revenues derived therefrom would grow in like proportion. In this way resources which are now giving no profit could be made to yield a handsome revenue, which should, in the beginning, be devoted entirely to the further development of the natural resources and agricultural industries of the Islands.

One of the first steps should be the establishment of forest nurseries of the best classes of timber in all large grazing districts and transplanting the young trees to the open lands with ample means of protection from destruction by animals and by fire. These trees can be so planted that they will not injure the lands for grazing purposes for twenty to thirty years, at the end of which time the forest of high grade timber will make the land more valuable for forests than for grazing purposes. The coarse grasses which are least useful for pastures in the Philippines thrive best in open lands, while the shorter grasses best suited for grazing flourish under partial shade. This combination of grazing and reforestation will not only be self-sustaining from the beginning, but will greatly enhance the value of the lands by the establishment of forests of the most valuable timbers of the Islands, which will by shading improve their value for grazing purposes and in turn the land will be enriched by virtue of the presence of animals thereon. Under such grazing contracts the lands would automatically revert to the Government and might be re-leased for grazing purposes, retained as commercial forests, or devoted to agriculture after the removal of the timber. As the great bulk of the unoccupied land of the Islands will not be required for agricultural pur-

poses for a quarter or a half century, unless there should be some unusual influx of population into the Islands, it is certain that the adoption of the proposed policy of leasing the lands for a long period of years could do no harm and on the other hand would result in untold benefits in many directions.

As a preliminary step in this work the Government of the Philippine Islands, and if necessary that of the United States, owes it as a duty to the people of these Islands to take immediate and drastic action, with the definite object in view of totally eradicating dangerous communicable animal diseases, more particularly rinderpest and surra, and forever prohibiting their reëntrance here again. Until this is done the live-stock business is extremely hazardous and there is no possibility of its extensive development.

REPORT OF THE DIRECTOR OF AGRICULTURE FOR THE FISCAL YEAR ENDING JUNE 30, 1910.

CONTENTS.

	Page.		Page
Administrative division	7	Division of plant industry—Continued	
Publications	8	Seed distribution	18
The Philippine Agricultural		Experiment stations	18
Review	8	Singalong experiment sta-	
Miscellaneous publications ..	9	tion	19
Library	9	Baguio experiment station ..	19
Agricultural extension work.....	10	Lamiao experiment station ..	20
Crop reporting and statistics.....	10	La Granja Modelo.	20
Forage factory	11	Iligan tobacco station	20
Crop pests	11	Division of animal industry.	20
Division of plant industry.....	13	Control work	21
Plant investigations	13	Rinderpest	21
Abaca	13	Surra	22
Low-grade fiber	14	Hemorrhagic septicemia	23
Abaca waste	14	Foot-and-mouth disease	23
Abaca-stripping ma-		Quarantine service	23
chines	14	Manila quarantine	24
Maguay and sisal	14	Iloilo quarantine	24
Rubber	15	Cebu quarantine	25
Coffee	15	Matadero inspection	25
Citrus fruits	15	San Lazaro immunizing station ..	25
Avocado pears	16	Serum laboratory	25
Bananas	16	Alabang stock farm	28
Corn	17	Trinidad stock farm	30
Rice	18		

DEPARTMENT OF PUBLIC INSTRUCTION, BUREAU OF AGRICULTURE, *Manila, P. I., August 12, 1910.*

SIR: I have the honor to submit herewith the annual report of the Director of Agriculture for the fiscal year ending June 30, 1910.

ADMINISTRATIVE DIVISION.

The extensive operations of the veterinary corps necessitated a material increase in the number of American employees during the past year. Of forty-one appointments to classified positions, twenty-four were veterinarians; three, agricultural inspectors; three, agricultural assistants; one, superintendent tobacco experiment station; four, American clerks; and six, Filipino clerks. There were separated through resignation, transfer, and otherwise, four veterinarians, four agricultural inspectors, four Amer-

ican clerks, and two Filipino clerks. The net increase at the close of the fiscal year was twenty American and seven Filipino employees. There has developed an appreciable degree of increased efficiency in the personnel, attributable to the correlation of the work of the sections within divisions and to the increased coöperation of each division with the others.

PUBLICATIONS.

The following publications have been issued during the year: May and June numbers of THE PHILIPPINE AGRICULTURAL REVIEW for 1909, the twelve numbers of the REVIEW for the fiscal year 1909-10; a revision of Farmers' Bulletin No. 12, "Abacá (Manila hemp)"; and Rinderpest Circular No. 1.

THE PHILIPPINE AGRICULTURAL REVIEW.

The work of the office of publications has been confined almost entirely to the publication of THE PHILIPPINE AGRICULTURAL REVIEW. The aim during the past year has been to make the REVIEW a magazine that shall meet the needs of the farmers throughout the Philippine Islands and bring them more closely in touch with the work of the Bureau of Agriculture. The many letters received from farmers expressing their hearty appreciation of the REVIEW, and the large number of requests that are received for both English and Spanish copies, indicate that this publication is doing a useful work.

Two special numbers of the REVIEW have been published during the year: the Annual Report of the Director of Agriculture in the January number, 1910; and the Carnival number for March, 1910.

The following table shows the principal subjects that have been covered in the REVIEW during the year and the number of pages devoted to each subject:

Subject	Number of articles.	Number of pages.	Subject.	Number of articles.	Number of pages
Rice	2	11	Mango	1	4
Coconut	5	11	Oranges	1	6
Pineapple	3	20	Rubber	2	14
Sugar	12	25	Live stock, etc.	8	41
Tobacco	7	21	Poultry	3	9
Abacá	7	22	Locusts	3	18
Kapok	3	11	Rat pest	1	5
Silk culture	1	4	Irrigation	2	8
Corn	1	7	Agricultural education ..	9	31
Coffee	1	7	Conservation	1	5
Cacao	3	15	Good roads	1	6
Peanuts	1	17	Labor	1	1
Ginger	1	4	Homesteads	1	2

In addition to the above a great deal of material on general agricultural conditions, both in the Philippine Islands and in other tropical countries, also statistical material, has been published in the REVIEW.

The circulation of the REVIEW is now about 6,000. The English edition is sent to 290 persons in Manila, 1,302 in the provinces, 17 in Hawaii, 253 in the United States, 5 in Porto Rico and 228 in foreign countries. The Spanish edition of the REVIEW is sent to 128 persons in Manila, 2,688 in the provinces, and 42 in foreign countries. The exchange list of the REVIEW includes practically all of the leading magazines on tropical agriculture throughout the world.

MISCELLANEOUS PUBLICATIONS.

A revised edition of Farmers' Bulletin No. 12, "Abacá (Manila hemp)," has been published during the year, also Rinderpest Circular No. 1. There is a widespread demand for printed matter on the following subjects: Coconuts, sugar, tobacco, and garden work. Material for bulletins on these subjects is being collected.

LIBRARY.

The work of the librarian includes: (a) The care of the books, periodicals, pamphlets, maps, etc., in the library; and (b) the mailing and distribution of THE PHILIPPINE AGRICULTURAL REVIEW and other printed matter of the Bureau Agriculture.

A considerable part of the books in the Bureau of Agriculture library belong to the Bureau of Science and are held on memorandum receipt. A large amount of material on agricultural subjects in the form of bulletins, pamphlets, and periodicals is being collected each year by the Bureau of Agriculture, and this material now forms an important part of the library.

The material in the library is available for use by the general public during the regular office hours of the Bureau. Books not in too constant use are loaned to responsible persons on memorandum receipt.

The distribution of THE PHILIPPINE AGRICULTURAL REVIEW and the bulletins published by the Bureau occupies the larger part of the time of the library force. There is a large and constantly growing demand for printed matter on agricultural subjects, and during the year 4,409 back numbers of the REVIEW were distributed in response to these requests.

The mailing list of the REVIEW has been revised during the year and a substantial amount of "dead material" has been dropped from this list.

In October, 1909, about 1,500 copies of the United States Department of Agriculture Yearbooks for 1907 and 1908 were received from Hon. Benito Legarda for distribution. These yearbooks have formed a valuable addition to our supply of agricultural literature.

AGRICULTURAL EXTENSION WORK.

Señor Pablo Tecson, superintendent of agricultural extension work, has visited the Provinces of Batangas, Bulacan, and Nueva Ecija during the year in the interest of agriculture.

In these provinces conventions have been held with the provincial and municipal officials and leading farmers. At these conventions agricultural questions of general interest have been discussed and information furnished regarding the work of the Bureau of Agriculture.

CROP REPORTING AND STATISTICS.

Crop and live-stock reporting under the provisions of Act No. 1898 of the First Philippine Legislature, "An Act providing that municipal presidents shall make special quarterly reports on the condition of agriculture, live stock, and on other matters in their respective municipalities," was started on July 1, 1909. The preparation of crop reports under this new system was work with which all of the municipal reporters were unfamiliar, and as a result the majority of the reports received for the first quarter had to be returned for correction. There has been a gradual improvement, however, in the quality of the reports received for each succeeding quarter, and it is believed that the passage of Act No. 1898 has done much toward placing the crop-reporting work on a satisfactory basis.

For the purpose of keeping this Bureau in constant touch with agricultural conditions in each municipality the monthly crop reports are being continued. The monthly report covers general agricultural conditions, such as the condition of crops and live stock, injuries to crops from pests, local prices of crops, etc., while the quarterly report is largely statistical.

The following is a summary of the reports received during the year: Total number of monthly reports received, 4,220; total number of quarterly reports received, 2,646; total number of regular correspondents at end of year, 797.

The data included in the quarterly reports are tabulated for each province and municipality, separate tabulations being made for crops and live stock. Tabulations are also made of the local prices of staple crops as shown by the monthly reports.

The establishment of an efficient and satisfactory crop-report-



PLATE II --INTERIOR VIEW OF THE FORAGE FACTORY AT PANDACAN, MANILA

ing service, even under the most favorable conditions, is a work that requires years to accomplish. This work, however, is an essential part of agricultural development. In view of the obstacles that have had to be met it is considered that substantial progress has been made in this work during the year.

FORAGE FACTORY.

The machinery installed for the purpose of drying and manufacturing forage from Philippine products has been in operation during the greater part of the year. Experimental lots of forage have been made and sent to the Army and the city stables for test; these mixtures were composed of dried guinea grass, ground corn, and ground beans. The ingredients were so mixed as to give a complete ration similar to the crushed fodders purchased on the markets. These samples were reported upon adversely by both the Army and the city stables. It was claimed that the animals could not be induced to eat the mixture. However, the same mixture has been used at the farms of the Bureau with good results.

After several experiments in drying green grass by artificial heat it was found to be unprofitable, owing to the large amount of coal and labor required to drive off the water to such an extent that the grass would keep when packed in bulk. It was then decided to buy grass, corn fodder, and other roughage after it had been field cured. This met with more success. The only thing now standing in the way of using large quantities of this field-cured fodder is the question of transportation. The small farmers who provide the bulk of this kind of fodder have no means of baling the fodder, and when not baled the freight charges are excessive. A mixture was then tried of ground corn, ground beans, and bran; the mixture having a composition about equal to that of oats. This mixture has been used in large quantities at the farms of this Bureau and the serum laboratory where large numbers of animals have been fed with good results. Further experiments will be undertaken to successfully dry green forage for the purpose of supplying roughage as soon as a new drier can be secured.

CROP PESTS.

The time of one agricultural inspector has been given to this work during the entire year. Many reports have come in relative to damage done by rats, wild hogs, and insect pests such as locusts, and cutworms.

Rats do more or less damage to cultivated crops in most all parts of the Islands, but the larger number of reports come

from the Island of Luzon. The general habits of the rodents and the unfailing food supply renders the use of poisons for exterminating them impracticable. Traps, however, were generally successful as agents in controlling them, and will be used to a greater extent in the future. In their relations to the sugar crop the amount of damage done by the individual rat is greater than that to any other crop. This is due to the fact that whenever a cane is gnawed the entire cane is spoiled by fermentation.

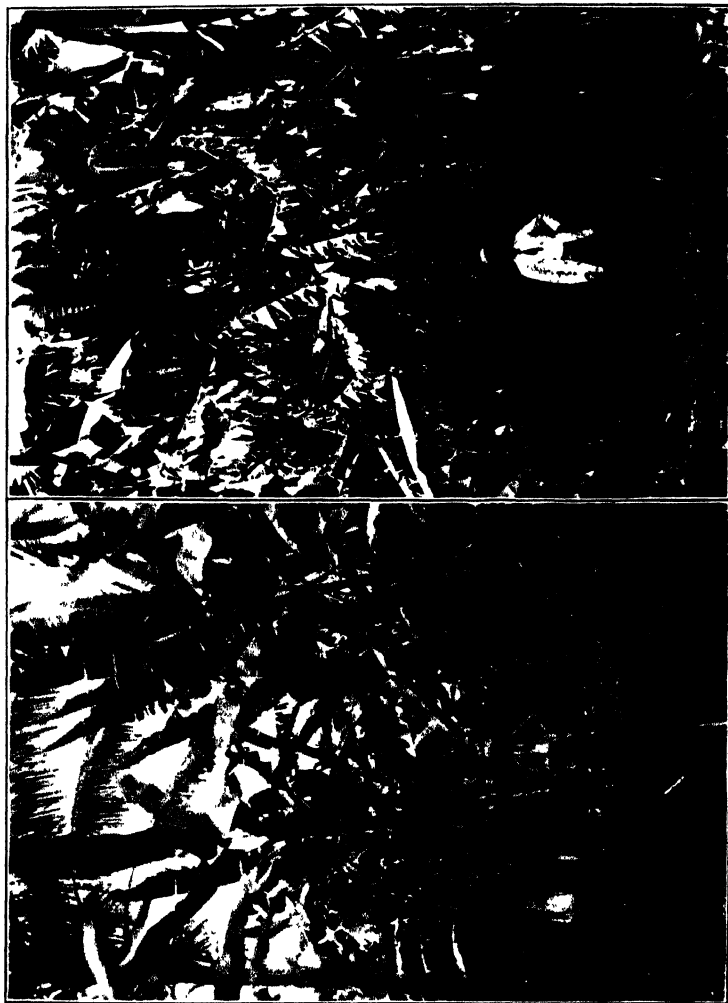
Locusts were prevalent in a number of localities during the months of August and September, due largely to the prevailing drought which was favorable to them. The pest was investigated in La Laguna Province and experiments with insecticides were tried. Under American supervision these were generally successful, but it was found not advisable to put insecticides into the hands of those not accustomed to their use. They do not seem to be able to comprehend the danger attending the grazing of cattle on poisoned foliage.

In connection with investigations made relative to the damage done by wild hogs to young coconut groves, examination showed that the loss by the hogs could in a great degree be abated by a little more exertion on the part of the owners in cleaning out some of the undergrowth in the vicinity of the groves.

During the tobacco season, the entire Cagayan Valley was visited and a study of the insects that affect the tobacco crop of that district was made. Special attention was given to the species that affect the growing plants and preventative methods were suggested.

During the latter part of the year a caterpillar resembling the army worm made its appearance in northern Batangas. Special attention was given this matter owing to the fact that the species, which was a common native one, had never before reached such proportions as would warrant it being classed as a serious pest. Specimens of this species have been taken in many of the provinces of Luzon and an examination of the agricultural journals of India shows that it also occurs there, sometimes causing considerable local loss.

The cause of the Batangas outbreak may be attributed, in part at least, to the building of the railroad through the district which has caused larger areas to be brought under cultivation, thereby making conditions favorable for such an increase. Little trouble need be anticipated in the future from this insect, as a study of a large number of individuals showed that a large percentage of them were carrying the eggs of a small parasitic



(a)

(b)

PLATE III - ABACÁ. (a) MAGUINDANAO AND TANGONGON VARIETIES (b) LIBUTON VARIETY

fly. So great was this percentage that during the next season their number will be so greatly reduced that their presence in the rice fields will be hardly noticeable.

DIVISION OF PLANT INDUSTRY.

This division includes all general plant investigations, seed distribution, laboratory and field tests of seeds, and work at the experiment stations. Experimental work is carried on at the following places: Singalong experiment station, located in the southern part of Manila on sandy soil, at sea level; Baguio experiment station, located at Trinidad, subprovince of Benguet, at an elevation of 1,500 meters; Lamao experiment station, located at Lamao, Bataan Province, at sea level; Ilagan station, located at Ilagan, Isabela Province, devoted to tobacco culture; and La Granja Modelo, located near La Carlota, Occidental Negros. The latter station is devoted largely to experiments with sugar cane, maguey, abacá, and rubber.

At the beginning of the fiscal year a fiber expert was appointed to study the fiber plants of these Islands and make recommendations to the fiber growers.

PLANT INVESTIGATION.

ABACÁ.

Practically all of the abacá districts of the Islands were visited by the fiber expert during the year. The fiber growers, as a rule, have entered heartily into coöperation with the Bureau and gratifying results are expected. A study of the varieties of abacá shows that there are some fourteen varieties growing in the various districts. The principal differences among these varieties are color, shape, size of stalk, their tendency to multiply, yield, and quality of their fiber. While the names are not as yet well established they are in common use in the districts where the varieties are found. The following table shows weight, length, circumference, and per cent of fiber in nine of the leading varieties:

Names of varieties.	Average weight of one stalk.	Average length of stalk.	Average circumference at—		Weight of dry fiber from 3 stalks.	Percentage of fiber.
			Base.	Top.		
	Kilos.	Meters.	Cm.	Cm.	Kilos.	
Tangolgon	88.67	5	84	40	6.89	2.6
Bangulanon	33.50	3.8	59	33	2.34	2.3
Maguindanao	86.50	4.6	84	36	4.40	1.7
Libuton	72.70	4.3	84	41	3.73	1.7
Arupan	69.70	3.9	79	46	3.78	1.8
Putean	63.30	4.1	71	36	3.42	1.8
Sinaba	62	4.2	72	48	2.52	1.3
Baguisanon-Iawaan	106	5.4	87	41	4.53	1.4
Agutay	39.80	3.8	65	35	1.80	1.5

Taking all things into consideration the first five varieties may be considered most desirable.

Low-grade fiber.—It was noticed that in nearly all the abacá districts the large percentage of low-grade fiber usually coming from these districts was due to one or more of the following causes:

1. Knives with serrations too far apart.
2. Reduction of the tension of the knife on the block of wood.
3. Delay in pulling the strips after they have been separated from the sheaths.
4. Leaving the hanks of wet fiber tied up under shade.
5. Exposing the fiber to successive changes of sun and rain.

It is obvious that the last three practices impair the quality of the fiber and possess no advantage whatever. There can be no reason that justifies such neglect in the handling of the fiber.

Owing to the low price of hemp prevailing during the last year and a half, the fields have not been kept in prime condition; many fields have been dug up and planted to other crops. This will result, in a short time, in reducing the available supply to such an extent that the price is bound to increase.

Abacá waste.—The planters have taken great interest in this subject and offered to coöperate with the Bureau in getting a market established for this product which has heretofore gone to waste.

Abacá-stripping machines.—There are four abacá-stripping machines on the market at this time, but none are in extensive use. An attempt was made during the last Philippine Carnival to have all of these machines on exhibition, but only two companies exhibited.

MAGUEY AND SISAL.

No extensive investigations were made of these plants during the year, as most of the time of the fiber expert was given to abacá. An inspector, however, was in the maguey and sisal districts of Cebu for three months giving instruction to the people relative to planting and harvesting. Much difficulty was experienced in getting them to give sufficient space to the plants when setting out. They seem to think that the more plants they put on the land the more fiber they get.

One and one-half million sisal bulbils were furnished the Philippine Railway Company for distribution along their lines in Cebu and Panay.

Aside from the above-mentioned plants data were collected relative to the following: Pineapple (*Ananas sátiva*); cabo-



(a)

(b)

PLATE IV ABACA: (a) SINABA AND TANGOGON VARIETIES (b) BAGUISANON LAWAAN VARIETY

negro (*Arenga saccharifera*) ; pugahan (*Caryota urens*) ; anahao (*Corypha*) ; and the ticog grass from which are made the famous Samar mats.

Farmers' Bulletin No. 12, relating to the fiber industry has been revised and republished.

RUBBER.

Further data relative to the three species of rubber growing at Singalong experiment station are given in the following table, showing the growth during the past three years. These measurements were taken one meter from the ground.

[Centimeters in circumference.]

Tree.	Hevea brasiliensis.			Castilloa elastica.			Manihot glaziovii.	
	1908	1909	1910	1908	1909	1910	1909	1910
No. 1 -----	21	27	40	31	40	48	39	45
No. 2 -----	24	35	53	30	(*)		46	56
No. 3 -----	22	33	43	37	42	(*)	51	66
No. 4 -----	26	36	49	27	37	45		

* Blown down by storms.

The plantation of Ceara rubber at La Granja Modelo has been increased to two hundred and eighty trees. These trees are growing vigorously and have produced quite a quantity of seed, which was collected and distributed. About eighty of these trees are now ready for tapping.

COFFEE.

The fifteen trees of Maragogipe hybrid coffee growing at the Singalong station yielded a total of 8 liters of dried seed during the year. The berries were small, though the quality appeared good. The trees seem to be healthy and some produce fairly well while others produce practically nothing.

The Liberian coffee planted at Lamao experiment station has made a growth of about one meter during the year. Considerable ripe fruit has been harvested and distributed for planting.

CITRUS FRUITS.

The Lisbon lemon trees growing at Lamao began bearing in March. About one hundred and fifty fruits have been taken from ten trees, leaving quite a number of fruits on the trees at the end of the fiscal year. The lemons are normal in shape, thickness of rind, and acidity, but the strictly lemon flavor is wanting. No reason for this has been discovered. The trees are free from disease and continue to make vigorous growth.

One hundred orange trees, twenty-five trees each of four varieties that appeared to be suitable for this climate, have been imported, half of each variety have been set out at Lamao and the other half sent to the orange district near Lipa.

AVOCADO PEARS.

Two of the avocado pear trees growing at the Singalong experiment station bore fruit this year for the first time. The quality of the fruit was up to the standard. The trees are making vigorous growth and it is hoped that the remaining trees will bear fruit soon.

BANANAS.

Data relative to varieties of bananas grown at Lamao were collected as follows:

The *matabia* variety of banana is from 16 to 20 centimeters in length, 5 centimeters in diameter, of a brownish yellow color when ripe, has an acid flavor, and may be used as a substitute for apples when cooked. The cost of growing was 5.7 centavos per bunch.

The *lacatan* is from 10 to 13 centimeters long, 3.5 centimeters in diameter, of greenish yellow color, sweet in flavor, and is said to be the best variety of banana grown in the Islands. The cost of growing per bunch was 47 centavos.

The *gloria* is from 10 to 12 centimeters long, 3 to 3.5 centimeters in diameter, of a dark yellow color, and has a sweet flavor. The cost of growing per bunch was 11.7 centavos.

The *Chinese dwarf* is from 12 to 16 centimeters long, 3 to 3.5 centimeters in diameter, light yellowish green color, sweet flavor, but is a poor shipper. The cost of growing per bunch was 38.6 centavos.

The *latundan* is from 8 to 12 centimeters long, 3 to 3.5 centimeters in diameter, bright yellow color, acid flavor, and is the most common variety grown in the Island of Luzon. The cost of growing per bunch was 2.8 centavos.

The *saba* is from 7 to 10 centimeters long, 4 to 5 centimeters in diameter, brownish yellow color, has no distinct flavor, and is used for cooking only. The cost of growing per bunch was 3.2 centavos.

The cost per bunch was obtained by counting the cost of labor in caring for one-tenth hectare of each variety and dividing the cost by the number of bunches obtained. Most of these varieties were planted at the rate of 700 plants per hectare; the larger growing varieties require more room than the smaller ones like the Chinese dwarf.



PLATE V LIBERIAN COFFEE TREE AT LAMAO EXPERIMENT STATION

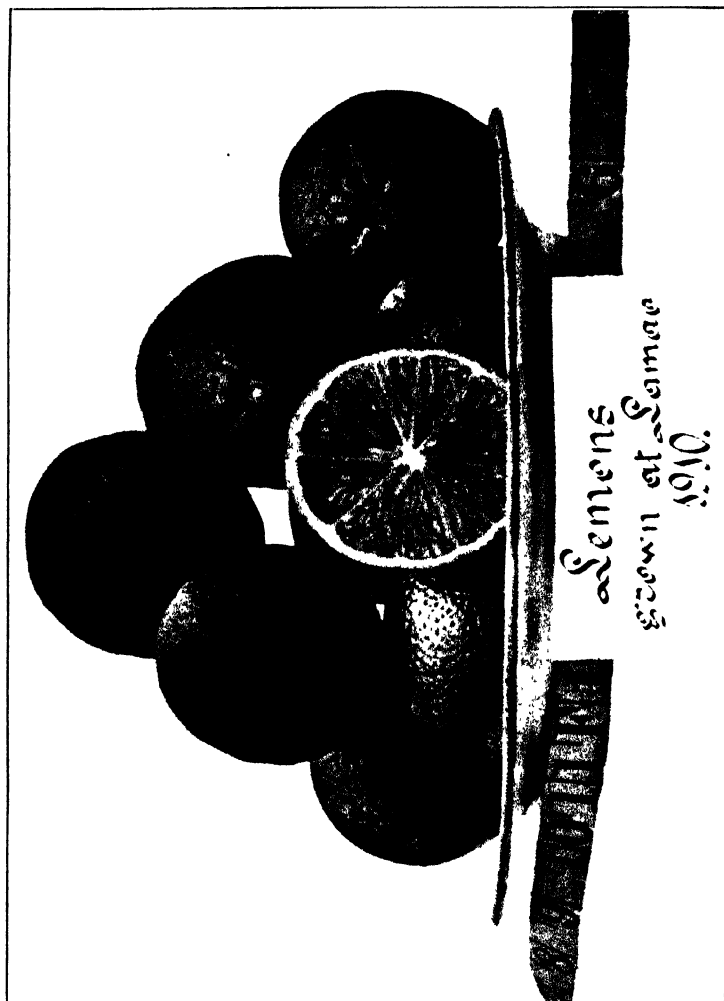


PLATE VI.—LISBON LEMONS GROWN AT LAMAO EXPERIMENT STATION

CORN.

During the preceding year a plat of ground at the Singalong station was devoted exclusively to the production of Mexican June corn for the purpose of ascertaining the number of crops and yield possible within a year. This plat was planted June 23, 1909, on ridges 20 centimeters high and 90 centimeters apart. The crop was gathered on September 30, 1909, and the plat replanted on October 15 in the same manner. During the growing period of both of these crops the soil was very wet, so that thorough cultivation was impossible and the corn made rather unsatisfactory growth. The first crop was also seriously injured by a typhoon which occurred during the time when the corn was blooming. After the harvest of the second crop on January 22 and 23, 1910, the ground was plowed and ridged as before and planted on February 2; this time, however, the seed was put into furrows instead of on the ridges as before to insure deep rooting during the dry season. It was necessary to replant a part of the plat February 15 on account of the failure of a great deal of the first seed to germinate. This crop received such irrigation water as was necessary. Frequent cultivations were given, the last cultivation being on April 4, leaving the ground nearly level. The corn ripened unevenly on account of the replant. The first planting was gathered May 15 and the replant May 31. Planting again occurred on June 9. The following table will show the results in condensed form:

Crop	Date planted	Date harvested	Number of days to maturity	Yield of ear corn per hectare
First.....	June 23, 1909.....	September 30, 1909.....	99	Kilos 1,300
Second.....	October 15, 1909.....	January 22-23, 1910.....	100	1,858
Third.....	February 3, 1910.....	May 15-31, 1910.....	103	2,840
Fourth.....	June 9, 1910.....			
Total.....				5,998

Thus, in the total time of 302 days a yield of 5,998 kilos of ear corn per hectare was produced. This amount of corn in the ear would, according to recent tests of Mexican June corn, equal about 4,798 kilos of shelled corn per hectare. A heavy dressing of stable manure was given to this land previous to the first planting. This variety grown at Lamao station produced at the rate of 3,381 kilos per hectare for one crop, without any fertilizer. We are now prepared to distribute this variety extensively.

Two varieties of native white corn from Siquijor, called by the inhabitants of that island *saguiril* and *kalapdos*, have been planted at the Lamao station. The yield of the latter appears to be prolific, while the former does not promise so well.

RICE.

During the last two years considerable time and money have been expended in collecting data relative to rice culture. The names of varieties grown have been collected from each of the rice-growing provinces; samples of varieties, or descriptions of them, were obtained wherever possible. These samples were worked over in the office, taking color, measurements of grains, whether glutinous or nonglutinous, and all other data relative to the grain, that could be obtained. One hundred and sixty-five lowland varieties were planted at Alabang on what is considered good land. Data relative to the behavior of varieties under field conditions were recorded. Such duplicates as could be recognized were taken out and the remaining varieties replanted together with about two hundred and sixteen other varieties collected during the year.

Some three hundred and fifty-five varieties of upland rice were planted at Lamao during May, the conditions at this farm being favorable for upland rice. As soon as the data for this crop is in, a comparison of varieties will be made.

SEED DISTRIBUTION.

During the year we have distributed 8,010 packages of vegetable seeds, 784 collections of flower seeds, 6,732 kilos of Mexican June corn seed, 8,480 maguey bulbils, besides the 1,500,000 sisal bulbils furnished the Philippine Railway for distribution, 44,150 mulberry cuttings, 999 collections of tobacco seed, and other miscellaneous seeds and plants. Two hundred kilos of Robusta coffee seed was distributed in the Mountain Province and Basilan. Cotton seed has been distributed largely in the Mountain Province and Mindanao.

EXPERIMENT STATIONS.

The work of the various experiment stations and farms of the Bureau has been hampered more or less during the past year, as in former years, on account of lack of funds for carrying on the work. We are yet without a superintendent of experiment stations, owing to the fact that a suitable man can not

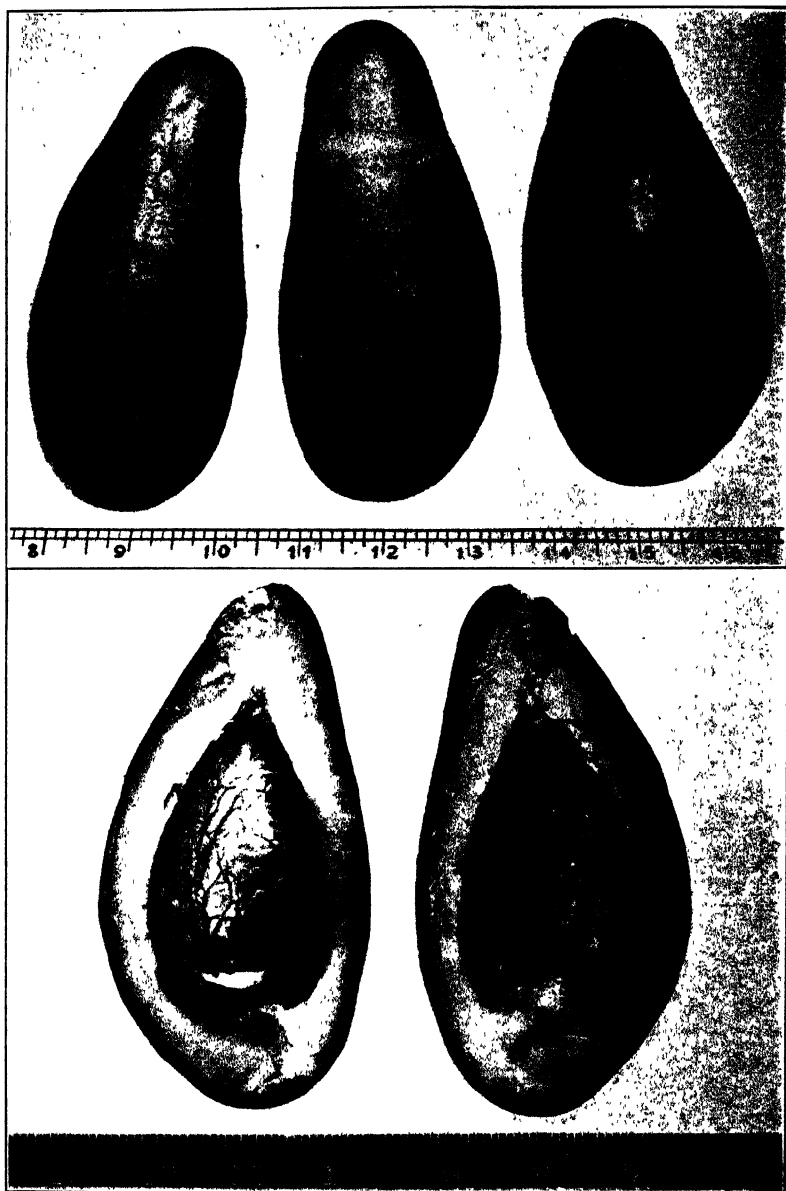


PLATE VII —AVOCADO PEARS GROWN AT SINGALONG EXPERIMENT STATION.

be found at the salary which we are prepared to pay, however, we are in communication with a man now whom we hope will be secured. Considerable progress has been made in the investigations of crops, methods of culture, etc.

SINGALONG EXPERIMENT STATION.

The work at the Singalong experiment station was in charge of Mr. H. A. Ireland from the beginning of the fiscal year to September 6, at which time he was relieved by Mr. W. N. Birch. Very little experimental work has been carried on at this station during the past year owing to the fact that the Bureau expects to give up the grounds as soon as it can conveniently do so. Guinea grass has been grown on the greater part of the area for the purpose of supplying green grass for the cattle, horses, etc., also for the purpose of supplying requests for roots of guinea grass. This station is now used largely as a temporary quarantine station for live stock awaiting shipment to the serum laboratory.

BAGUIO EXPERIMENT STATION.

This station was in charge of Mr. M. C. Merrill from the beginning of the fiscal year until August 21, at which time he was relieved by Mr. E. S. Haskell, as superintendent, and Mariano M. Cruz, as foreman. The work at this station during the past year has been quite similar to that reported for the previous fiscal year. Practically the entire area has been devoted to the growing of vegetables for supplying the Baguio market. A much larger quantity of vegetables, however, has been grown than during the previous fiscal year. The total receipts for sales of vegetables amounted to ₱4,102.71, exceeding the amount expended for labor by ₱448.20.

Considerable damage was done to the crops on the farm by the very heavy typhoon which occurred on the 13th of October. It is safe to say that more than 75 centimeters of rain fell during the thirty-six hours which this typhoon lasted. Considerable damage was done by the high water depositing sand and silt over the small plants, such as strawberries.

During the year an attempt was made to grow green corn and guinea grass for the stock farm, but owing to the fact that the land used for this purpose had not been under cultivation for some years and was rather poor, the returns did not justify the expense; however, if the same land can be retained for a number of years, it is safe to say that the returns would be profitable after the land had been subdued and properly drained.

LAMAQ EXPERIMENT STATION.

This station has been in charge of Mr. O. B. Burrell, agricultural inspector, during the entire year. The work carried on consisted principally of the testing of tropical vegetables, fruits, and flowers. The location of this station makes it very favorable for this work, as the temperature is somewhat higher than the other stations belonging to the Bureau and the farm is well supplied with water for irrigation, also by reason of the fact that very little damage is done by typhoons owing to the protection afforded by the mountain range between this farm and the open sea. The damage done by wild hogs has been eliminated by the construction of a heavy woven-wire fence around the cultivated area.

LA GRANJA MODELO.

The work at La Granja Modelo was in charge of Mr. F. E. Deason from the first of the fiscal year until April 1, 1910, when he resigned and Mr. R. E. Burris was placed in charge. The work at this station has been continued along similar lines to those outlined in previous reports. A number of varieties of sugar cane are being tested, as well as varieties of corn and other farm crops. The live stock kept at this station has done well on native pasture, requiring only a small amount of additional feed. No permanent improvements have been undertaken, awaiting a decision as to whether or not this is to be made a sugar farm in fact. It is hoped that sufficient funds may be secured to develop the farm properly.

ILAGAN TOBACCO STATION.

On January 1, 1910, Mr. Charles A. Mahan was appointed tobacco expert and sent to the Cagayan Valley for the purpose of taking charge of the tobacco station. An appropriation of ₱6,000 having been made for the buildings and fencing, the Bureau of Public Works was requested to proceed with the construction of same. In the meantime, Mr. Mahan occupied his time by collecting such data as he could from the tobacco growers, and planning the work for the coming year.

DIVISION OF ANIMAL INDUSTRY.

This division includes the veterinary control work, the production of serum at the serum laboratory, the Alabang and Trinidad stock farms, and all other general investigations in animal industry.

CONTROL WORK.

During the year the veterinary corps has been thoroughly organized and substantial progress has been made toward the complete eradication of animal diseases from these Islands. Three factors are mainly responsible for the satisfactory results that have been obtained, viz, a large increase both in the veterinary force and in the available means for carrying on this work; the interest taken in the work, and the hearty co-operation given by Insular, provincial, and municipal officials; and the enactment and enforcement of provincial resolutions and municipal ordinances for the control and eradication of contagious animal diseases.

At the beginning of the year twenty-one veterinarians were on duty in this Bureau, all of whom were employed in veterinary work, except Dr. C. M. Morgan, who was in charge of the Trinidad stock farm. During the year four veterinarians resigned, one returned to the United States on leave of absence, and twenty-five were appointed and reported for duty. An average of thirty-nine veterinarians were on duty in the Bureau throughout the year. Of this number one was detailed for the entire year as superintendent of the Trinidad stock farm and for a part of the year one was detailed as acting superintendent of the Alabang stock farm. During the year an average of eight agricultural inspectors, six American inoculators, and fifty-six Filipino inoculators were employed in veterinary work.

Most of the attention of this division during the year has been directed toward the eradication of rinderpest, though the control of other contagious diseases has not been neglected.

RINDERPEST.

This disease has been present in 27 provinces and 229 municipalities. It has been eradicated in 15 provinces and 204 municipalities, and is now present in only 12 provinces and 25 municipalities. There have been but two serious outbreaks of rinderpest during the year, one in the Province of Batangas, the other in the Province of Occidental Negros. Six thousand and fourteen carabaos and 4,052 cattle have been found suffering with this disease; 4,768 carabaos and 3,108 cattle have been reported as having died with rinderpest; 63,325 inoculations of antirinderpest serum have been made, of which 4,025 were reinoculations; 1,350 deaths after inoculation have been reported.

In addition to the fact that the field force during the year has been more than twice as large as that of the previous year,

two other factors have been responsible also in a considerable degree for the results that have been obtained in the eradication of rinderpest. His Excellency the Governor-General has taken great interest in this work and by means of executive orders, by suspension of inactive municipal officials, and in other ways, has awakened a most helpful coöperative interest among both provincial and municipal officials, which in many cases has been noticeably lacking in former years. Constabulary soldiers have been used to a much greater extent than formerly. Wherever used they have aided very greatly in the suppression of outbreaks of disease. The inefficiency of the municipal police in maintaining quarantines has always been a serious obstacle to the obtaining of satisfactory results in the field work. Without exception employees of this Bureau who have been aided in their work by the Constabulary have reported their services as being very satisfactory. The maintaining of absolute quarantine is really the keynote of rinderpest eradication. In an unfenced country like the Philippines absolute quarantine is usually an impossibility, but in most cases it has been observed that the nearer perfect the quarantine system has been maintained the shorter has been the outbreak in any particular province.

Fairly satisfactory provincial resolutions and municipal ordinances have been enacted in a number of different provinces and municipalities during the year, and in many cases have been well enforced. The importance of every province and municipality in the Islands enacting resolutions and ordinances for the control and eradication of contagious animal diseases can hardly be overestimated. Inasmuch as provincial boards and municipal councils seldom take action in this matter, unless urged and assisted by an employee of this Bureau, it is desirable that most of the time of at least two employees be devoted to this work.

SURRA.

This disease has been quite widespread during the year. It has been found in 29 provinces and 106 municipalities. At the end of the year but 12 provinces and 15 municipalities were reported as infected with surra. Because of the special campaign that was being waged against rinderpest the efforts directed against surra have been more along the line of control than eradication, and in only two districts—Marinduque and Bohol—has a systematic, though limited, campaign of eradication been carried on. During the year 148 animals were found infected

in 7 municipalities, of which number 106 were carabaos. The coöperation of the people has been excellent and it is believed that this disease can be entirely eradicated during the coming year. The fact that so many carabaos in the two provinces above mentioned harbor the infection has made the problem of eradication particularly difficult. On the Island of Marinduque both the officials and the people have opposed the work. Executive influence was brought to bear upon the officials of this subprovince during the latter part of the year and there is now being shown more satisfactory interest in the work so that it is believed the disease may soon be eradicated.

In coöperation with the Bureau of Science experiments have been conducted with a view to finding a satisfactory and practical cure for surra in large animals. While some horses and cattle were cured, the length of time required and the high death rate among those treated, has led to the conclusion that no methods of cure have yet been discovered which are of any considerable practical value for field work.

HEMORRHAGIC SEPTICEMIA.

This disease has been diagnosed in eight provinces, but only in one municipality (Palanig) has it been of serious consequence. It has been present in several municipalities in the Province of Pangasinan, but the death rate has not been large in any locality. This disease usually takes the form described in the text-books as "deer and cattle disease" or "barbone." It usually affects carabaos and cattle under one year of age, and is known by the Filipinos as "gartillo."

FOOT-AND-MOUTH DISEASE.

This disease, which was so widespread in these Islands during the previous fiscal year, has been present, with the exception of a few enzoötic cases, only in the ports of entry, and at these places principally among cattle imported from Hongkong and held on lighters.

QUARANTINE SERVICE.

Quarantine stations have been maintained at Manila, Iloilo, and Cebu, but only at Iloilo has there been a Government corral available.

During the first eleven months of the year all imported cattle and carabaos found on arrival diseased, infected, or exposed to infection, were held on lighters in the bay and not allowed to land except for immediate slaughter. On June 1, 1910,

General Order No. 15, modifying General Order No. 13, was issued and no animals known to be diseased have since been allowed to land. The issuing of General Order No. 15 is one of the most important measures ever adopted in connection with this work.

MANILA QUARANTINE.

A total of 106,228 animals have been inspected on arrival, of which number 42,942 were imported animals, and 18,554 animals have been inspected and shipping permits issued for their removal to the provinces.

The trade in imported cattle has been characterized by the small number of ports of embarkation. The major portion of the cattle were embarked at Pnom Penh (Indo China) and Hongkong. All of the carabaos, with the exception of a single animal, were embarked at Pnom Penh. All imported animals arriving at this port during the year, with the exception of those embarked at Hongkong, were apparently free from any infection on arrival. With the exception of three shipments, consisting of 142 head, all cattle arriving from Hongkong were either infected or considered exposed to infection and held upon lighters in the bay.

Due to the fact that all imported cattle were quarantined on lighters in the bay and were not allowed to come ashore except for immediate slaughter, conditions in the cattle corrals in Manila, as well as in Iloilo and Cebu, have been incomparably better than in former years. During the fiscal year 1909, 3,779 cattle and 614 carabaos, representing 56 separate lots, were infected in Manila with rinderpest or foot-and-mouth disease. Because of the prevalence of disease a great number of infected cattle and carabaos were shipped to the provinces, there to disseminate disease. During the fiscal year 1910 only 441 cattle and 2 carabaos, representing 9 lots, were infected in the city of Manila, and it is not believed that any infected animals were shipped to the provinces. The number of new outbreaks in the provinces receiving cattle and carabaos from the ports of entry have been noticeably fewer during the year just passed than in former years.

ILOILO QUARANTINE.

At this place 17,282 animals have been inspected on arrival and 7,988 animals inspected for shipment and certificates given for the removal to the provinces. The Government quarantine corral was opened about September 1, 1909, and has been in use since that time. While the number of animals arriving

for quarantine has been greater than the normal capacity of the corral, they have all been accommodated and the corral has been of much service. It is arranged that the capacity of this corral be doubled as soon as possible.

CEBU QUARANTINE.

Here, as in Manila, animals have been quarantined in the owners' corrals. A Government quarantine corral is badly needed in Cebu and such a corral should be completed at the earliest possible date. Four thousand one hundred and sixty-two animals have been inspected on arrival in this port and 666 animals inspected for shipment and certificates given for their removal.

MATADERO INSPECTION.

This division has had charge of the veterinary inspection at the Manila matadero during the year. Ninety thousand seven hundred and forty-one animals were inspected ante-mortem and 89,696 post-mortem; 23 were condemned on ante-mortem inspection and 875 on post-mortem inspection; 69,431 parts of carcasses were condemned as unfit for human consumption.

SAN LAZARO IMMUNIZING STATION.

This station has been greatly improved by the reconstruction of three sheds and other minor repairs. It has been used as a station for immunizing cattle and carabaos for the general public and animals intended for the serum laboratory at Alabang, also as a depository for animals being held for shipment to Alabang or to the provinces and for vaccine calves for the Bureau of Science. A few animals suspected of glanders and surra have been quarantined at this station pending diagnosis.

SERUM LABORATORY.

The most noteworthy feature of the years' work has been the large increase in the production of serum, with the attendant additions and improvement of facilities for handling this increase. The degree of extension is shown by the fact that the number of serum cattle on hand at the end of the year is 524, while the number on hand for the corresponding day of last year was 154.

To accommodate the additional herds and to provide the necessary facilities for the increased amount of work, numerous additions and improvements have been made at the serum laboratory, the more important of which are the following: The con-

struction of two new sheds housing 64 animals each, remodeling the old dairy shed, the construction of a new isolation shed for virulent blood animals, the construction of houses for laboratory foreman and student assistants, the installation of a new vacuum plant and a 500-gallon water tank, the laying of larger water mains and supply pipes, and the installation of a windmill over the second artesian well.

The total production of serum for the year has been 10,145.8 liters (30,437.4 bottles). The production of serum increased from 507 liters in July, 1909, to 1,417.3 liters in June, 1910. There has been an almost constant increase in production throughout the year. Bleeding was discontinued for a week during November, during which time more ample facilities for the filtration work were being installed at the Bureau of Science. The total amount of blood drawn during the year has been 25,175.7 liters, the percentage of separation of serum being 40.28 per cent. This percentage of separation of serum from coagulum is the largest that has yet been obtained in this work. There has been a remarkable gain in percentage of separation during each of the past four years, as shown by the records of 22.7 per cent, 28.6 per cent, 38.38 per cent, and 40.28 per cent, respectively.

No material modifications have been made in the method of serum production. The process has been hastened somewhat by the shortening of the period between the third bleeding and subsequent inoculation to a minimum of four instead of seven days; the production of peritoneal fluid has been improved as to technic with a result that abscess formation at points of inoculation has been materially reduced. At the present time experiments are in progress to determine the advisability of abandoning the hyperdermic inoculation of the last (largest) hyperimmunizing doses of virus, and introducing these doses intraperitoneally. The advantages of the intraperitoneal method are that it is less painful and therefore results in less shock to the animal; the operation can be performed in a fraction of the time necessary for the hyperdermic injections; it should obviate to a great extent the considerable hospital lists due to abscess formations, and in the comparative immunity of the animal to peritonitis. No unfavorable symptoms have thus far been observed in the animals so treated.

The following have been the types of animals used in the production of serum: Indo Chinese, 456; Chinese, 117; Indian, 75; native, 59; carabaos, 10; total, 717. It will be observed

that a large proportion of the herd has been made up of the Indo Chinese cattle. Nearly all of these have been imported from Cambodia, which province produces much better cattle than Annam and Phuyen, the sources from which our serum cattle were occasionally drawn formerly. Fifty Indian steers and 25 Indian bulls have been carried in the herd for several months, but have not proven very satisfactory. All of these Indian cattle will be eliminated from the herd as soon as suitable animals can be obtained in their place. Native cattle have been purchased whenever animals of fair size and type were available. A few good individuals have been obtained but the majority have been too small. On the whole the effort to use native stock has not been very successful as they are wild, difficult to handle, do not respond well to stall feeding, and because of small size and unsatisfactory condition can be bled only 2 liters or less. The carabaos were admitted to the herd for experimental purposes and have proven quite satisfactory.

A total of 402 animals were used in the production of virulent blood, 381 of which were also used for the preparation of the peritoneal fluid. The total production of virulent blood has been 2,510.35 liters and of virulent peritoneal fluid 2,677.75 liters. A large percentage of these virus-supporting animals have been obtained from the Batanes Islands, and they are unquestionably the best available animals for the purpose.

The total losses of all classes of animals during the year have been as follows: Serum, 40; virulent blood, 40; completed, 1; serum native, 9; carabaos, 2; and vaccine, 7. The losses by rinderpest have been very small during the year. Foot-and-mouth disease, which in former years interfered most seriously in serum work, has not been an important factor this year. Surra has been discovered in many of the cattle. Special effort has been made to eliminate this disease so far as possible, but the problem is a difficult one.

The following classes of fodder have been used at the serum laboratory during the year: Rice straw, sorghum, zacate, guinea grass, crushed feed, rice meal, bean meal, bran meal, corn meal, mixed feed, sugar cane, and corn stalks. In the future the hay ration will be seldom used as it seems probable that sufficient sorghum and other green fodders will be available. Some difficulty has been experienced in maintaining all the animals in satisfactory condition. At the end of the year, however, the entire serum herd, with the exception of the native cattle, was in very good condition.

ALABANG STOCK FARM.

The Alabang stock farm was in charge of Mr. H. J. Gallagher from the beginning of the fiscal year until April 1, 1910. Dr. H. F. Hungerford has been acting superintendent during the remainder of the year.

Climatic conditions at this farm have been generally favorable during the year.

The supply of labor has been abundant, but the quality is far below the standard, probably for the reason that most of the young men in this vicinity go to Manila, leaving chiefly young boys and older men to work on the farm. Most of the laborers live from 2 to 3 miles away, which is a great disadvantage. It is desirable that all of the labor be housed on the farm. The average pay of the ordinary day laborer is about 60 centavos per day.

During the past year many improvements have been made, among the more important of which are the following: The rebuilding of the main roads from the railway station to the farm and serum laboratory, the construction of a new machinery shed, bodega, hog shed, and several houses for laborers. About 33,000 meters of wire fencing have been built during the year.

About 12 hectares of new land have been put under cultivation during the year. Most of this can be reached by irrigation and promises to give excellent results. With an increased water supply there is much more good land on this farm than can easily be put under cultivation. The total amount of land now under crops is approximately 30 hectares.

A number of fertilizer experiments have been carried on during the year, particularly with sugar cane. The best results have been obtained with a mixture of double superphosphate and tobacco dust. Good results have also been obtained with a mixture of tobacco dust, tankage, bone charcoal, and muriate of potash.

During the months of August and September the farm was twice visited by locusts, but fortunately the numbers were not great and beyond the damaging of some experimental rice no harm was done.

Corn has been damaged to some extent by a green worm, but other than these two, the farm has been exceedingly free from insect pests. The principal crops grown during the year have been "Mexican June" corn, sugar cane, sorghum, guinea grass, and para grass. The corn, although attacked to some extent by a green worm, gave a fair yield of excellent forage. The sugar

cane was planted late but yielded a good heavy cane about 10 or 12 feet long, which furnished a supply of cuttings for re-planting, and forage for pigs and cattle. Sorghum may well be considered the standard forage crop for this part of the country. Several fine crops of sorghum have been obtained. Considerable difficulty has been experienced in previous years in growing guinea grass satisfactorily at this farm. A determined effort was made during the past year to grow it successfully, with the result that it has given heavy yields of forage. Para grass, although not as heavy a yielder as guinea grass, has done well.

There has been a marked improvement in the condition of all live stock at the farm during the year. This may be ascribed to better conditions under which the stock is now being handled, to the improvement in the pastures, and to the fact that the animals are gradually becoming more acclimated and used to their surroundings. An outbreak of surra resulted in the loss of a number of our mares. In connection with this outbreak, experimental work was carried on in the treatment of this disease and a number of animals were saved. These are now in first-class condition. At the present time we have on hand a total of 74 horses, 48 of which are mares, and 26 stallions. Practically all of the 3- and 4-year-old stock have been broken for saddle use, and three teams of young mares are being trained in harness.

The Australian dairy herd was disposed of during the year. Since the sale of the dairy herd we have left on hand a herd of cattle chiefly Chinese and Galloway-Chinese crosses. This cross has the advantage of being larger than the original Chinese stock, remains in good condition both during the wet and dry seasons, and seems to be entirely suitable for this country.

These cattle have passed through the entire year without food other than the natural grasses of the range, and are now in first-class condition.

The hogs on the farm have kept in excellent condition throughout the year, and the demand for breeding animals has been much greater than we have been able to supply.

Guinea pigs and rabbits are still being raised in limited numbers and at high cost. The guinea pigs breed only in small numbers, probably due in part to the constant in-breeding. The rabbits appear to do little better under the open-run conditions than they did formerly in cages.

An effort is being made to put this farm, as far as possible, on

a self-supporting basis and with this end in view more land is constantly being put under cultivation. At the present time the forage crops will more than pay for the cost of the actual agricultural operations.

TRINIDAD STOCK FARM.

This farm remained in charge of Dr. C. M. Morgan until April, 1910, at which time Dr. David McKibbin, jr., was detailed as acting superintendent and Doctor Morgan given leave to return to the United States.

The rainy season this year was the most severe which has ever been experienced and was marked by two severe storms which occurred in July and October. The Trinidad Valley became flooded and resulted in the loss of several head of live stock belonging to the farm and to private parties, and in some injuries to the pasture there.

The areas devoted to breeding pastures in this valley have been increased by adding a separate inclosure on the west side next to the stock farm and used largely for native mares brought in during pregnancy to be bred after foaling. Twenty mares belonging to private parties have been bred in this way. This system has proved the most successful of any so far used.

Other improvements have been made by extensive repairs to the American horse barn, the erection of three cattle sheds, building 3½ kilometers of good fence, and the planting of small areas to oats, corn, and paspalum grass. About 16 hectares of land, subject to irrigation, was leased near the Trinidad farm and planted in corn and sorghum to be used as forage crops. Some green forage was also produced on the Trinidad farm. This has materially reduced the cost of maintenance of animals on the stock farm.

The stock on hand at the end of the fiscal year consisted of 53 horses and mares, 3 mules, 84 head of cattle, 8 goats, and 8 head of sheep. The increase in the live stock by birth has consisted of 25 colts and 20 calves. The death rate among the stock on the farm has been very small, and most of those that occurred were due to accidents and to exposure during the heavy typhoons.

The greatest progress in the production of live stock on this farm has been made in the breeding and rearing of colts sired by Arabian stallions, and out of native mares. The first one of these colts raised on the farm reached maturity and has been broken for work during this year. There are on hand five 2-year-olds, which are very promising, and about twenty-five yearlings,

from which we will no doubt obtain some exceptionally fine horses of this type. These are the most promising colts of any type so far bred by this Bureau. It is contemplated that in the future horse breeding at this farm will be limited largely to the production of this type.

Cattle continue to thrive well on this farm, especially since land in the Trinidad Valley has been available for pasture during the dry season.

The grade herd of Galloway and native crosses continues in excellent condition, and further demonstrates the desirability of this type of cattle for similar conditions throughout the Philippines.

The herd of Hindu cattle sent to this farm has not done nearly so well as the native and grade cattle, and their removal to a lower altitude, where there is less rain and a higher temperature, is contemplated in the near future.

The Angora goats kept here are doing fairly well, but require careful attention and housing, as they suffer severely from exposure during the heavy rains with resulting low temperatures.

Sheep have also done only fairly well and require better care and attention than would be practicable on a sheep ranch.

Very respectfully,

G. E. NESOM,
Director of Agriculture.

The honorable,
the SECRETARY OF PUBLIC INSTRUCTION,
Manila, P. I.

GENERAL ORDER NO. 18.

DEPARTMENT OF PUBLIC INSTRUCTION,
BUREAU OF AGRICULTURE,
Manila, P. I., December 10, 1910.

GENERAL ORDER }
No. 18.

In view of the fact that rinderpest and foot-and-mouth disease have recently occurred among cattle from Hongkong while in quarantine on lighters in Manila, and by authority of Act 1760 of the Philippine Commission, section 2 of General Order No. 15 is hereby canceled and superseded by the following regulations:

1. If cattle, carabaos, sheep, goats, or swine brought to the Philippine Islands from any foreign port considered and declared by the Director of Agriculture to be infected with dangerous communicable animal disease arrive apparently free from such disease, they will be permitted to land ninety days after their departure from the port of origin, provided no disease has appeared among them during this period. Permission will be given for the transfer of such animals from the vessel on which they arrive to lighters, cascos, or other suitable vessels, where they will be held until the above-mentioned ninety days shall have elapsed; or, if any such animal disease appears until they have been free from disease for a period of ninety days, when they may be brought ashore.

2. The provisions of this General Order shall become effective December 20, 1910.

G. E. NESOM,
Director of Agriculture.

Approved:

NEWTON W. GILBERT,
Secretary of Public Instruction.

FORMS USED FOR QUARTERLY REPORTS UPON CROPS AND LIVE STOCK.

The crop and live-stock reporting forms sent to correspondents have been modified from time to time as experience has shown where they could be improved. A considerable change was made in them effective for the fiscal year beginning July 1, 1910; they having been increased 50 per cent in size and the questions so amplified as to eliminate as far as possible any chance for a misunderstanding on the part of those filling them in. Act No. 1898, "*An Act providing that municipal presidents shall make special quarterly reports on the condition of agriculture, live stock, and on other matters in their respective municipalities,*" went into effect July 1, 1909, and the first year of its operation showed a considerable gain over the preceding year in completeness and accuracy of the reports received.

Appended is the new blank form. These forms are sent to the presidents of municipalities, townships, and *rancherías*. Each question is printed in English and Spanish but to reduce the size only the English is given here:

B. A. FORM No. 28.

DEPARTMENT OF PUBLIC INSTRUCTION. BUREAU OF AGRICULTURE.

QUARTERLY REPORT UPON CROPS AND LIVE STOCK.

Municipality of, Province of
..... Quarter, months of, 19

GENERAL QUESTIONS.

1. What crops, if any, have been injured by drought, excessive rains, or winds?

2. What crops, if any, have been injured by insects, such as locusts, etc., rats, or by blights?

3. Give names, in the order of their importance, of the five principal crops grown in your municipality

4. Give names, in the order of their importance, of some of the crops of minor importance grown in your municipality

LIVE STOCK.

Questions.	Horses.	Cattle.	Carabaos.	Hogs.	Goats.	Sheep.
5. Number in municipality at the beginning of the present quarter.....						
INCREASE.						
6. Increase because of births.....						
7. Increase because of receipt from other municipalities, by purchase or otherwise.....						
8. Grand total.....						
DECREASE						
9. Number of deaths from disease.....						
10. Nature of disease causing deaths (par. 9).....						
11. Number of deaths from old age.....						
12. Decrease because of transfer to other municipalities because of sale or otherwise.....						
13. Number of deaths by accident.....						
14. Number slaughtered for food in the abattoir or other places.....						
15. Decrease from all causes.....						
16. Number in municipality at the end of the present quarter.....						
17. What is the average local value of each of the following animals".....						

Remarks:

.....

.....

.....

.....

.....

Questions.	Palay. ¹	Sugar cane.			Tobacco.	Corn.
18. If at the beginning of the present quarter land was under cultivation which had been sown (but not harvested), state how many hectares						
19. If during the present quarter new land has been put under cultivation, state how many hectares have been sown						
20. Add the number of hectares sown during the present quarter to those under cultivation at the beginning of the quarter (question No. 18) and give the grand total						
21. What is the condition of the growing crops?						
22. If during the present quarter some of the land under cultivation has been harvested, state how many hectares						
23. Deduct the number of hectares harvested from the grand total under cultivation (par 20) and state how many hectares are still under cultivation						
	Liters	Marketable form			Kilos	Liters.
		Sugar (kilos)	Panocha (kilos).	Basi (liters).		
24. State what has been the total quantity harvested (in weights or measures as indicated in the following columns) during the present quarter						
25. What quantity of these products is held by planters and local dealers at the end of the present quarter?						
26. What is the present local value of the products, i. e., those grown in the municipality?	Palay (per liter).	Sugar (per kilo)	Panocha (per kilo).	Basi (per liter).	Per kilo	Per liter

¹ In answering questions 25 and 26, where hulled rice is given as a unit of measure, the word "rice" should be written over the quantity given.

NOTE.—75 liters=1 cavan; 63.25 kilos=1 picul; 46 kilos=1 quintal.

Questions.	Hemp.	Ma-guey.	Coconuts.				Coffee.	Cacao.
27. If at the beginning of the present quarter land was under cultivation (planted before that time), state how many hectares.			Entire number of trees.					
28. If during the present quarter new land has been put under cultivation, state how many hectares have been planted.			Entire number of trees.					
29. Add the number of hectares planted during the present quarter to those under cultivation at the beginning of the quarter (question No. 27) and give the grand total.			Entire number of trees.					
30. What is the condition of the growing crops?								
31. If during the present quarter some of the land under cultivation has been harvested, state how many hectares.			Entire number of nuts					
32. If during the present quarter some of the plants or trees have ceased bearing, state the number of hectares which they covered.			Entire number of trees					
33. Deduct the number of hectares from which the plants or trees have ceased bearing from the grand total under cultivation (par. 29) and state how many hectares are still under cultivation.			Entire number of trees.					
	Kilos	Kilos.	Marketable form				Kilos	Kilos
34. State what has been the total quantity harvested (in weights or measures as indicated in the following columns) during the present quarter.			No of nuts	Copra (kilos)	Oil (liters)	Tuba (liters)		
35. What quantity of these products is held by planters and local dealers at the end of the present quarter?								
36. What is the present local value of these products, i. e., those grown in the municipality?	Per kilo.	Per kilo.	Per nut	Copra (per kilo).	Oil (per liter)	Tuba (per liter)	Per kilo.	Per kilo.

NOTE.—63.25 kilos = 1 picul; 11.5 kilos = 1 arroba.

Remarks:

.....
Municipal President.

I hereby certify that the municipal council approved this report in resolution No.

.....
Municipal Secretary.

MONTHLY VETERINARY REPORTS—NOVEMBER.

RINDERPEST.

Iloilo.—At the beginning of the month of November, there were four barrios infected with rinderpest in the municipality of Miagao. One of these barrios had been infected for five months, two for three months, and one for one month. The animals in one of these barrios had been injected with serum seven times, in two barrios five times, and in one barrio once. Owing to this fact, it was decided that other measures than use of serum and ordinary quarantine were necessary to eradicate the disease. About the middle of November all the animals in these barrios were tied with short ropes, in groups of not more than ten animals in each group, and the police and Constabulary were directed to inspect and count these animals twice daily. The success obtained by this method of quarantine has exceeded all expectations as there has not been a single case of disease in any of these barrios since these measures were introduced.

Cebu.—During the month seven animals became infected in five municipalities.

Pangasinán.—Rinderpest exists in four municipalities and while there are not many cases, it will be difficult to entirely eradicate the disease without increasing the field force in this province.

Tarlac.—A thorough and systematic quarantine is being introduced by which it is hoped that rinderpest will be held in check and danger of its introduction from neighboring provinces greatly lessened. The provincial authorities are actively co-operating with the veterinarians of the Bureau of Agriculture.

Zambales.—No cases of rinderpest have occurred during the month and a quarantine is being maintained against infected provinces.

Nueva Ecija.—During the month rinderpest has been completely eradicated in two municipalities and but one infected municipality now exists in the province. The effective quarantine maintained by the Constabulary greatly aided in obtaining these results.

Oriental Negros.—It has been found very difficult to check the spread of rinderpest reported here last month owing to the fact that stock owners and municipal officials have been rather slow in coöperating in the work of constructing the necessary corrals in which to quarantine the animals affected.

Leyte.—Rinderpest is decreasing in this province.

MONTHLY CROP REPORTS—NOVEMBER.

RICE.

Cagayan.—In the rice-growing districts of this province the harvesting has been somewhat retarded, and much of the crop damaged by the recent rains and floods.

Ilocos Norte.—From information at hand the rice crop of this province for the present year will be larger, and of a superior quality to that for the year 1909. The municipality of Bangui on account of having numerous rivers, which afford natural systems of irrigation, contains some of the largest tracts of rice land in the Province of Ilocos Norte. There are, however, large tracts of good land in this municipality that, for the lack of irrigation, are at the present time uncultivated, but they could be converted into valuable land by the establishment of a good irrigation system. This municipality has 279 hectares of upland, and 2,474 hectares of lowland rice under cultivation which promises a larger crop per hectare than that of the preceding year.

Ilocos Sur.—The upland rice called "lampadan" has been harvested, and has yielded a fair crop. The condition of the lowland rice, which is now growing, is unsatisfactory in places having no irrigation. The farmers in the municipality of Santo Domingo state that their rice is affected with a kind of rust. The crop will be below the average.

Mountain Province.—Rice harvesting is practically over in the different sections of this province; the crop being very good in both quantity and quality. The Igorots are now busy repairing the old walls of their rice fields, and building new ones; a work that is necessary each year. As usual the crop of rice in the municipality of Bontoc is not sufficient for the needs of the people, so that much will be brought in from northern Bontoc and Kalinga.

Nueva Ecija.—It is estimated that the rice crop throughout the province will be about 30 per cent short of a normal crop. This is due to the fact that the rains came too late. Palay now sells at ₱3 per cavan.

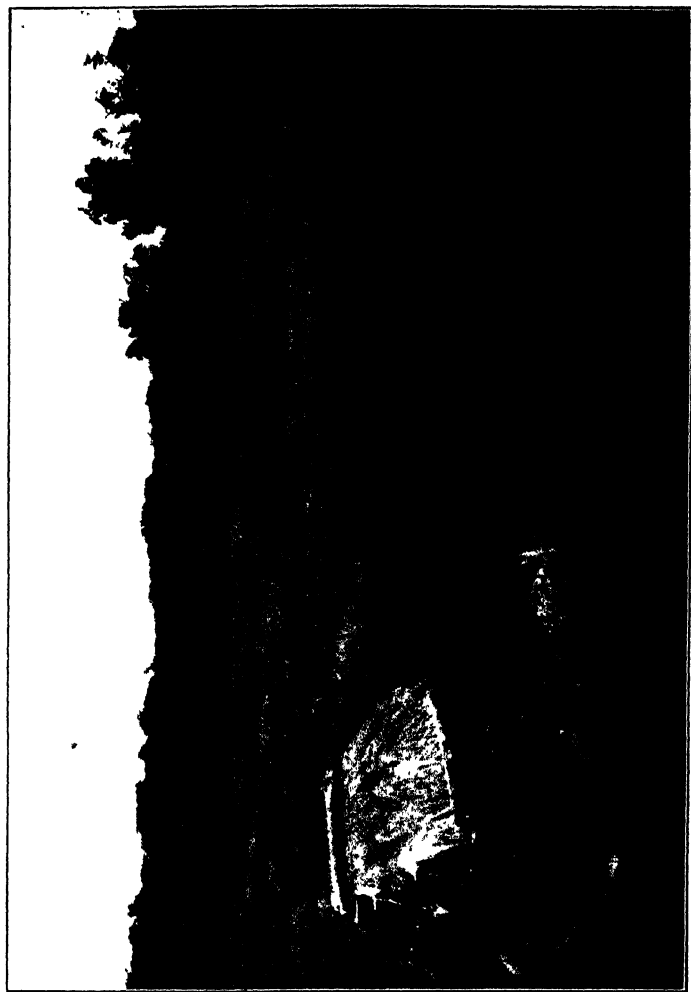


PLATE VIII.—FIELD OF UPLAND RICE AT LAMAO EXPERIMENT STATION.

Tarlac.—Rice has been damaged to some extent by the lack of rain during the past few months, but it is impossible at the present time to estimate the extent of this damage. Rice is now being harvested, and the work of harvesting will continue during the month of December. Large tracts of rice land are now lying idle in the province because of the shortage of labor, and lack of facilities for irrigation.

Zambales.—Rice harvesting has been the principal work of the farmers throughout the month. In all parts of this province nearly all available labor is employed in the rice fields. Most of the farmers report at least a normal crop; a number report a better crop than last year. There is some especially good rice in Zambales this year, but this part probably does not represent one-tenth of the area planted to rice. There is a very marked difference in the crop on the fields immediately adjoining, where the same seed was used, and where soil conditions were apparently the same. This difference seems to be due entirely to the time of planting.

Tayabas.—In some places where upland rice is raised there will be a shortage of the crop, but this affects few municipalities and is of such small quantity as not to be of importance. The lowland rice crop will be as good as usual.

Ambos Camarines.—Reports from the Partido de Lagonoy, including the municipalities of San Jose, Goa, Lagonoy, Tigaon, Sagnay, and Caramoan indicate that an unusually heavy rice crop will be harvested in a few weeks. More land than usual, in fact all that was suitable for the purpose, was planted in rice this year. The crop has not been molested by rats or locusts.

In the Bicol River and Libmanana sections of the province the rice crop was retarded very much by the late rains, and is about two months behind last year's crop. More land than usual has been planted in most parts of this district, particularly in Bula and Minalabag, and the present condition of the crop is at least up to the average.

The mountain rice crop was unusually heavy this year and has been nearly all harvested. Small patches of it were damaged in some sections of Minalabag and Lupi by the locusts, but the loss compared to the total area planted was insignificant.

The price of rice has advanced considerably here during the past two months and it is estimated that more than ₱50,000 worth of it was received during October at Nueva Caceres alone. This is a rather bad showing for what is perhaps the richest and one of the largest rice-growing sections in the Islands.

Albay.—Rice harvesting has commenced in this province. In the municipalities of Oas, Polangui, and Libon an insufficient supply of water has been a source of worry to the farmers and the rice in some places is poor in quality and turning yellow. Late rains, however, have helped the situation. Altogether the rice crop is the largest in years.

Marinduque.—There have been frequent rains during the month of November, and many of the farmers are now preparing their land for rice planting.

Bohol.—The rice and corn crops do not promise to be as good as last year on account of the heavy rainfall. The damage done by locusts has been little up to the present time in comparison with that which was done last year.

Cebu.—A large part of the rice crop in the northern part of the island was destroyed by the typhoon early in the month, but little damage was done in the main rice-growing section of Carcar.

Iloilo.—Most of the young rice is in excellent condition even though it was planted late. The weather has been very favorable for rice during the month of November. The young rice did not suffer from the last typhoon, but that which was in bloom, and approaching maturity, suffered severely.

The harvesting of the rice crop has been the principal agricultural work done in this province during the month of November. On December 1 this work was practically completed in almost all parts of the province. About 75 per cent of the usual harvest is expected.

Capiz.—The harvesting of rice has been going on throughout the month, and the farmers report that the crop is short by a third.

Occidental Negros.—The rice crop in Siaton and Bayauan will be shorter than usual on account of late planting.

Surigao.—The planting season is just now beginning and conditions are very favorably for the work.

Cotabato.—The harvesting of an exceptionally large rice crop was commenced during the latter part of October, and some 200 sacks were recently shipped from Cotabato.

ABACA (MANILA HEMP).

Ambos Camarines.—The "Partido de Lagonoy" is the heaviest abacá-producing section in this province, but the price of abacá has been so low—10 centavos per kilo—that the growers are badly discouraged and are devoting all of their time in trying to raise some other crop and are stripping as little abacá as possible.



PLATE IX.—THRASHING OUT RICE AT LAMAO EXPERIMENT STATION.

SUGAR CANE.

Nueva Ecija.—The area planted to sugar cane in this province has been doubled the past season, and the growing crop is now in good condition.

Tarlac.—Sugar cane is grown in different parts of this province not extensively, but in sufficient quantities to indicate that Tarlac might be made a sugar-producing province of importance. The cane throughout the province is in good condition. It is believed that the farmers in this province should be encouraged to plant more sugar cane and, that in some cases, land that is now planted to rice would give better results if planted to cane.

Cebu.—The sugar cane of Cebu is in promising condition and the prospects are that there will be a large crop. An inspection of the territory from Carmen to Argao indicates that the sugar crop for this year will be larger than that of last year. The appearance of the cane fields, however, is not what it should be for the reason that some of the fields were planted late and in most cases the cane was planted too close and did not receive proper cultivation. Farmers in this section prefer the small short cane because such cane is more easily crushed in their small wooden mills and also the juice from the small cane is more concentrated and yields a better grade of sugar.

The cane fields of Carcar and Talisay are in good condition as compared with the fields in other towns along the line of the railway. The typhoon apparently did not do much damage to the cane fields. Only one field was observed that had suffered to any considerable extent from the typhoon.

About 85,000 piculs of sugar are expected for this year's crop. At present the yield per hectare is not more than 40 piculs. With proper methods of cultivation such as the use of good plows, fertilizers, and irrigation the same land could be made to produce from 70 to 90 piculs per hectare.

Irrigation would be practicable in many places in the Province of Cebu as there are many streams from the mountains that cross the lowlands.

There is great need at the present time for the establishment of a modern sugar central in Cebu. If such a central were to be established a large part of the cane could be transported from the fields to the mill by the railroad, as 90 per cent of the 85,000 piculs above referred to, is produced on an area all of which is within 2 kilometers of the railway line.

Iloilo.—Large areas of sugar cane were damaged in the municipalities of Barotac Nuevo, and Dingle, by the flood and typhoon early in the month. Some of the farmers had begun to mill their cane, but were obliged to stop on account of the heavy rains.

Capiz.—Sugar cane in the southern part of the province was damaged to some extent by heavy rain storms early in the month, but, as it is now near the milling season, it is not believed that there will be any great loss. The farmers were making preparations during the first part of the month to mill their cane.

Oriental Negros.—There has been a little too much rain in this province for the sugar cane. There will, however, be a good crop.

Occidental Negros.—The present outlook for sugar is excellent.

Surigao.—There are a few small sugar haciendas in the municipality of Surigao; these haciendas produce sugar for local consumption only.

Cotabato.—From Tamantaka to Tumbao, and along the Tamantaka River, considerable sugar cane is being cut by the Moros. The cane is large and of very good quality. It is believed that only about 40 per cent of the juice is obtained, owing to the crude wooden mills used by the Moros for crushing the cane.

COCONUTS.

Tayabas.—The increased production of copra, due to the better care now given the coconut plantations, and the fact that young trees are now coming into bearing; and the continued good prices received for copra, so affect general conditions in this province that a shortage of other crops seems to produce no impression on the general economic conditions. Former pasture lands and waste places are now being planted to coconut trees.

TOBACCO.

Cagayan.—Tobacco is a fair average crop, although much of it was damaged by the typhoon in September, and by the flood of the past week.

Cotabato.—In the vicinity of Pakit, and along the upper Rio Grande a very good grade of tobacco is grown. The leaves are large and well formed, and, although practically uncured are made by the Filipinos and Moros into very fair cigars. It is believed that if the Moros were taught to properly cure and cultivate their tobacco a very good quality could be produced.

CORN.

Cagayan.—Corn is said to be somewhat better than last year.

Bohol.—Corn was badly blown down by the typhoon of November 1 and 2, but there will not be a complete loss of the crop.

Cebu.—The corn crop of Cebu is not in a very promising condition, as a considerable amount of the growing crop was destroyed by the typhoon.

Iloilo.—In the southern part of the province a few hectares were planted to corn during the latter part of the month, and at the end of the month the people who were through with their rice harvesting were plowing their corn land.

Oriental Negros (Siquijor).—The principal crop on this island is corn. The fields are in bad condition at the present time, owing to the excessive rainfall. During the past few months it has been almost impossible to cultivate the fields, and the weeds have taken possession. Another drawback has been the scarcity of carabaos.

RUBBER.

Cotabato.—The new Rio Grande Rubber Company has purchased a considerable amount of gutta-percha, and instead of shipping it in its crude form, as do the Chinamen, have put in several washing machines, and are turning out a very good grade of clean gutta-percha.

Sulu.—The Lapoc Plantation Company now has planted about 15,000 rubber plants, as well as 1,000 coconuts. The larger part of the rubber is Ceara, which grows very quickly, more quickly in fact than the same plant in Borneo or Ceylon. Some of the Ceara rubber trees on this plantation were from 18 to 22 inches in circumference when two years old. The planters here report that catch crops such as peanuts, tapioca, corn, etc., do not pay, except as they help to keep a good supply of trained labor on the plantation. It can easily be demonstrated on paper how the revenue from catch crops will pay the running expenses of the plantation during the first few years. From practical experience, however, this does not seem to be the case.

CURRENT NOTES—NOVEMBER.

LOCUSTS.

Ambos Camarines.—There are still immense swarms of locusts in this province and they have greatly damaged some plantings of rice, though the loss has not thus far been considerable. On the 11th of November a large swarm of locusts appeared in the neighborhood of Nueva Caceres and it looked for a while as though they might destroy all the vegetation for miles around. The second company of Constabulary was turned out to help fight these locusts and was able to destroy a great many. The swarms soon left the district and did but little damage. There are vast areas of uncultivated land all through this section and it seems to be very easy to keep the locusts on this unused land where they can do no harm. If, however, they are breeding, as they undoubtedly are, it is probable that great damage will be done to next year's crops. It is extremely difficult to get the people to destroy the locusts except when they are paid for the work, and even then their interest is somewhat languid.

Locusts appeared in the Camarines Norte district during the month of October, but as the rice has not yet been planted there they have done no harm thus far.

Leyte.—There are still some locusts in this province, but the officials are taking hold and with the assistance of the people are making good headway for the extermination of this pest.

Capiz.—The locusts are about exterminated in the province and no further damage is being done by them.

Oriental Negros.—The locusts do not seem to have harmed the crops in this province at any time during the present year.

Cotabato.—The locusts that were present during the month of September have disappeared from this district.

FAIRS AND EXPOSITIONS.

Occidental Negros.—An agricultural exhibition will be held in Bacolod during the latter part of December. Exhibits of all the agricultural products of the province have been promised by different *hacenderos*. The best of these exhibits will be forwarded to Manila for the Carnival.

Marinduque.—Through the efforts of Mr. E. E. Baker, supervising teacher, it is planned to have an agricultural exhibition in connection with the coming fiesta at Boac, beginning on, or about, December 3. Cash prizes have been offered for the best exhibit in order to stimulate an interest in the project.

RANGE OF PRICES OF PHILIPPINE AGRICULTURAL PRODUCTS.

Highest and lowest prices of unhulled rice, abaca, copra, sugar, tobacco, and corn for the months of July and August, 1910.

[NOTE.—75 liters=1 cavan, 63.25 kilos=1 picul; 46 kilos=1 quintal.]

JULY, 1910.

Province.	Unhulled rice per 75 liters		Abaca per 63.25 kilos.		Copra per 63.25 kilos.		Sugar per 63.25 kilos.		Tobacco per 46 kilos		Corn per 75 liters.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
Agusan	2.75	2.20	12.00	10.00	8.50	7.50	8.00	6.00	22.50	15.00	4.50	1.50
Albay	3.00	2.40	11.50	5.09	11.00	5.00	8.00	6.00	22.50	15.00	4.00	1.50
Amboi Camarines	4.50	2.50	11.00	6.50	12.00	6.00	8.00	6.00	22.50	15.00	4.00	1.50
Antique	3.50	2.30	18.00	11.00	10.00	8.00	8.00	6.00	22.50	15.00	3.75	2.00
Bataan	3.50	2.25	13.00	10.00	12.00	7.00	8.25	4.50	15.00	7.00	3.75	2.00
Palangas	3.50	2.50	15.50	8.25	12.00	7.00	10.00	4.50	15.00	7.00	3.75	2.00
Bohol	3.75	2.40	16.00	12.00	10.00	6.50	9.18	4.50	18.00	9.00	5.00	2.50
Bulacan	4.00	2.75	16.00	12.00	10.00	6.50	9.00	7.75	19.78	13.00	5.00	2.50
Cagayan	3.75	2.10	17.00	16.50	11.00	7.00	8.00	7.00	30.00	5.00	6.00	2.50
Capiz	3.00	2.30	15.50	9.50	11.00	7.00	9.40	5.25	12.00	12.00	3.12	1.25
Cavite	5.00	2.50	14.00	12.00	10.00	5.00	9.50	4.00	20.00	4.00	3.87	2.00
Cebu	4.00	2.50	14.00	12.00	10.00	5.00	4.00	4.00	16.00	5.00	3.00	1.00
Ilocos Norte	4.50	2.25	14.00	12.00	10.00	5.00	7.00	4.50	30.00	4.50	5.00	1.00
Ilocos Sur	4.00	2.00	14.00	12.00	10.00	5.00	9.00	5.50	22.00	5.00	3.00	1.50
Iloilo	4.00	3.12	12.00	6.00	8.00	6.32	9.00	5.00	30.00	7.20	5.00	2.50
Isabela	3.25	1.85	12.00	6.00	8.00	6.32	10.00	5.00	9.00	5.00	4.00	1.00
La Laguna	3.50	2.50	14.00	6.95	10.12	6.00	6.60	4.00	12.00	5.00	4.50	2.50
La Union	3.75	2.00	15.00	9.00	10.00	5.50	10.00	5.50	12.00	5.25	5.00	2.50
Leyte	4.00	2.50	15.00	9.00	9.50	6.95	10.00	5.25	27.00	21.00	4.00	2.50
Mindoro	3.50	3.00	8.25	7.00	10.00	8.22	8.25	4.00	18.50	2.50	6.25	1.00
Misamis	3.00	2.00	15.00	7.60	6.00	5.00	10.00	5.00	23.00	5.00	3.75	1.25
Moro	3.00	2.00	15.00	7.60	6.00	5.00	10.00	5.00	21.50	11.00	3.75	1.70
Mountain	6.00	2.50	16.00	8.00	11.00	6.50	10.00	6.50	30.00	6.00	3.75	2.00
Nueva Ecija	2.77	1.25	12.60	7.70	7.50	7.50	10.00	6.75	25.00	3.00	3.00	2.50
Nueva Vizcaya	3.12	2.50	16.00	8.00	11.00	6.50	10.00	6.50	30.00	6.00	3.75	2.00
Occidental Negros	3.25	2.50	12.60	7.70	7.50	7.50	10.00	6.75	25.00	3.00	3.00	2.50
Oriental Negros	5.00	3.25	12.60	7.70	7.50	7.50	10.00	6.75	25.00	3.00	3.00	2.50
Palawan	3.25	3.25	16.00	8.00	11.00	6.50	10.00	6.50	30.00	6.00	3.75	2.00
Pangasinan	3.00	2.20	12.00	6.00	8.00	6.32	9.00	5.00	9.00	5.00	4.00	1.50
Rangas	3.75	2.00	12.00	6.00	8.00	6.32	9.00	5.00	9.00	5.00	4.00	1.50
Rizal	3.12	2.50	12.60	7.70	7.50	7.50	10.00	6.75	25.00	3.00	3.00	2.50
Samar	3.70	1.50	15.00	1.00	9.00	5.50	7.60	6.00	30.00	6.00	3.50	1.50
Sorsogon	3.75	2.00	12.60	6.33	9.00	5.50	7.60	6.00	30.00	6.00	3.50	1.50
Surigao	2.75	2.00	12.00	10.00	8.50	7.50	10.00	6.00	30.00	6.00	3.50	1.50
Tarlac	4.00	1.75	15.00	5.00	8.50	6.00	10.00	4.00	20.70	5.82	2.50	1.50
Tayabas	3.25	2.00	15.00	5.00	8.50	6.00	10.00	4.00	20.70	5.82	2.50	1.50
Zambales	3.00	2.00	15.00	5.00	8.50	6.00	10.00	4.00	20.70	5.82	2.50	1.50

AUGUST, 1910.

Province.	Unbulled rice per 75 liters.		Abaca per 63.25 kilos.		Copra per 63.25 kilos.		Sugar per 63.25 kilos.		Tobacco per 46 kilos.		Corn per 75 liters.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
Agusan.....	3.00	2.20	12.00	8.50	10.00	8.00					4.00	1.50
Albay.....	3.50	2.50	10.00	5.20	12.00	4.00	8.00	6.00			4.00	2.00
Ambos Camarines.....	4.50	10.00	10.00	6.00	12.50	2.50	8.00	6.00			2.00	1.50
Antique.....	4.50	3.00	18.00	11.00	10.00	8.00	9.00	6.00	22.50	6.00	4.00	1.50
Bataan.....	3.50	2.25					8.00	4.00	15.00	6.50	4.00	2.00
Batangas.....	4.50	2.50	14.00	10.00		6.48	8.00	4.00	25.00	4.14	5.00	2.00
Bohol.....	4.00	2.50	16.00	8.25	13.00		9.48	5.00	18.00	9.50	2.55	2.00
Bulacan.....	4.00	2.50					9.50	7.00	19.78	7.00	5.00	2.50
Cagayan.....	5.00	2.50							30.00	6.00	3.75	1.50
Capiz.....	3.75	2.00	16.00	7.00	10.00	6.00	8.00	6.00			3.87	2.00
Cebu.....	3.00	2.60	16.00	15.00			9.00	5.00			5.00	2.50
Ilocos Norte.....	5.00	3.00	16.00	9.50	11.50	7.00	9.80	5.00	20.00	4.00	3.00	1.00
Ilocos Sur.....	4.00	2.50					4.00	4.00	16.30	5.00	4.00	1.00
Iloilo.....	4.50	2.75					7.00	4.50	30.00	4.50	3.00	1.50
Isabela.....	4.00	2.50	14.00	12.00	11.40	6.00	9.50	7.00	22.00	5.00	3.00	1.50
La Laguna.....	3.50	3.75							30.00	7.50	5.00	2.50
La Union.....	3.75	2.25	12.00	6.00	8.50	6.00	10.00	8.50			5.00	1.00
Legazpi.....	4.50	1.50	14.00	6.80	10.00	6.50	6.60	4.00	9.00	7.00	4.50	2.50
Marikina.....	4.00	2.50	15.00	9.00			9.71	5.50	30.00	4.60	4.50	2.50
Misamis.....	3.00	2.00	15.00	3.16	8.50	8.85	10.50	8.00	12.00	6.00	5.00	2.50
Mountain.....	2.77	2.40		5.69	6.00	5.00			27.00	21.00	3.00	2.50
Nueva Ecija.....	3.00	3.00					8.25	4.00	23.00	2.50	6.25	1.00
Nueva Vizcaya.....	3.25	2.00	16.50	8.00	11.00	6.50	9.50	6.00	23.00	7.50	4.00	1.50
Oriental Negros.....	5.00	3.00	13.12	6.00	12.00	4.00	10.00	7.50	22.08	11.00	3.75	2.00
Palawan.....	3.00	2.00			7.00	7.00			30.00	6.00	3.75	1.50
Pampanga.....	3.00	2.60					8.00	5.00	25.00	5.00	5.00	2.50
Pangasinan.....	3.75	2.00			9.50	5.25	10.00	4.00			3.00	2.00
Rizal.....	3.00	2.50					8.00	6.00	20.00	4.00	3.80	1.50
Samar.....	3.75	1.75	15.00	9.00					30.00	11.50	6.00	1.00
Sorsogon.....	3.75	2.00	12.00	5.08	8.85	5.50					3.50	1.50
Surigao.....	3.00	2.20	12.00	8.30	10.00	8.00	7.60	7.00	30.00	6.00	3.50	1.50
Tarlac.....	4.00	1.75										
Tayabas.....	3.25	1.50	15.00	4.50	8.80	6.00	10.00	5.00	28.00	5.82	2.50	1.50
Zambales.....	3.12	2.00			10.00	7.00	10.00	4.00	18.00	7.00	5.00	2.50

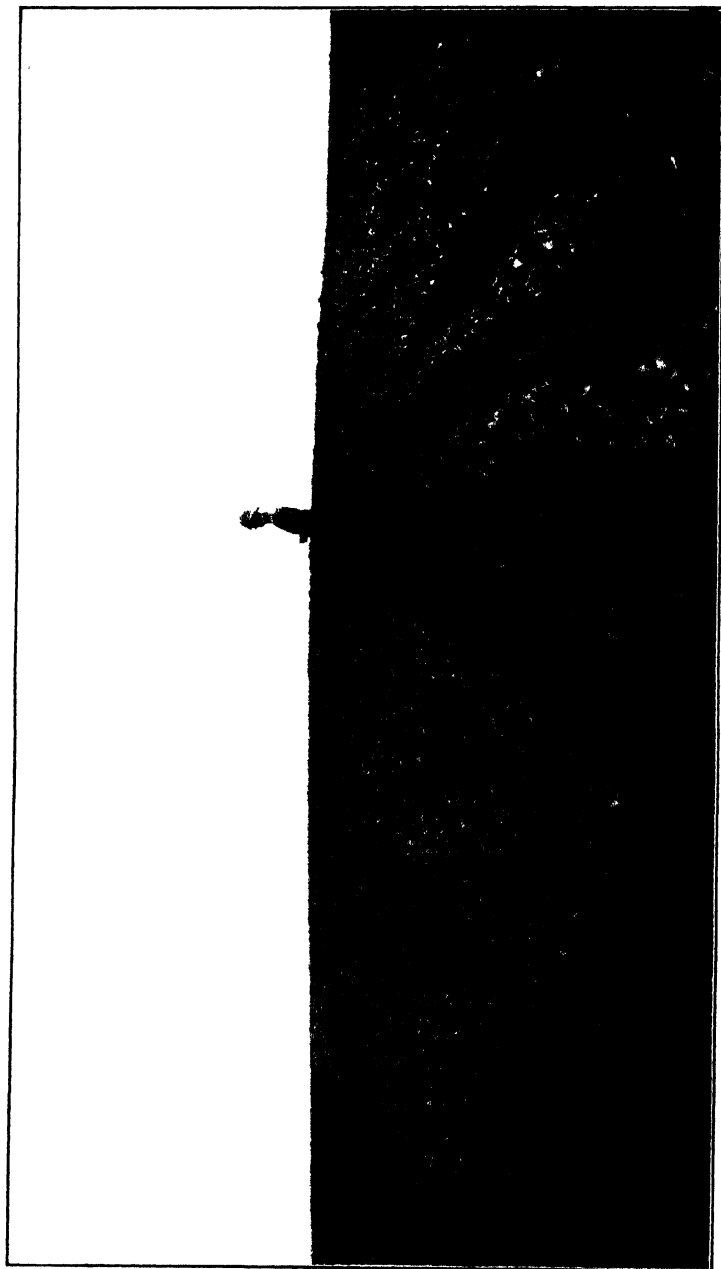
TEMPERATURE AND RAINFALL FOR AGRICULTURAL DISTRICTS IN THE PHILIPPINES.

By the DIRECTOR OF THE WEATHER BUREAU.

NOVEMBER, 1910.

[Temperature and total rainfall for twenty-four hours beginning at 6 a. m. each day.]

Date	Hemp.				Sugar, Iloilo.		Rice, Tarlac.		Tobacco.			
	Albay.		Tacloban.		Temperature.	Rainfall.	Temperature.	Rainfall.	Aparri.		San Fernando.	
	Temperature.	Rainfall.	Temperature.	Rainfall.					Temperature.	Rainfall.	Temperature.	Rainfall.
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
1	24.2	279.4	24.2	132.1	24.9	128.6	28.2	1.3	26.8	7.6	27.8	
2	26.5	6.1	27		25.3	1	26.8	19	26.6	3.8	28	
3	27.6		27.4		27.2		27.8		24.8	8.4	27.7	
4	27.4	2.8	26.7		27.3	5.8	26.2	2	24.9	2.8	27.4	.5
5	26.4	3.9	26.9	3	26.4	.8	27.6		25.5	2.3	27.2	7.6
6	27.4	7.6	25.8	24.9	25.8	16.2	27.4		24.9	2.6	26.6	
7	27.3	4.6	25.5	4.1	27.1		27.8		25.6		27	
8	26.4	9.7	26.2		27.8		28.1	1.8	26.3		27	
9	26.7		26.4	81.2	26.4	4.3	28.8	1.8	27.1	6.8	27.8	
10	25.1	.3	24.6	84.1	26		29		25.3	88.6	27	
11	25.4		25.2	3	26.1	32.5	28.4		24	12.7	26.7	
12	25.7	14	26.3		26.3		27.6		23.4	33.1	26.8	
13	24.6	25.4	25.8	.8	25.8		26.4	6.4	24.1	5.7	26	
14	26.6	.8	26.2	2	27	2.1	25	7.9	24.6	21.1	25.2	
15	27.4		27.8		26.9		28.3		25.1	.8	27.7	
16	26.5	5.4	25.6	7	26.5	3.6	28		25.7	50.6	27.1	22.6
17	27.7		26.4		26.1		27.4	6.4	23.2	287.7	23.8	
18	26.4	19.5	26.1	2	26.1	100.3	27		22.8	13.4	26.2	
19	25.6	10.4	24.6	13.7	25.1	9.9	27.8	1.8	23	12.7	27.1	3.8
20	26.8	16.3	25.5	28.9	25.7	4.3	26.6	8.9	24.4	5.1	26.3	1
21	25.8	27.9	26.2	9.4	26	13.7	27.3		25.5		26	
22	25.4	4	26.9	.8	26.5	3.5	23.2	19	25	34	24.1	
23	27.4	9.1	27.8		26.5	31.2	26.8	3.8	24.8	3.8	26.3	
24	26.9	22.4	26.1	17.8	25.9	27	28.3		25.2	1.8	26.8	
25	26.4	4.1	26.8	.5	25.7	6.9	27.4		25.5		26.2	
26	25.6	5.8	26.7	14.3	25.7	9.4	25.4		25.3		26.2	
27	27	7.6	25	24.6	25.1	38.9	26.7		25.4		25.6	
28	26.2	5.6	24.8		24.7	5.5	27.2		25.2		25	
29	26.5	2.5	26.3	.5	24	19	26.6		25.3		25	
30	25.5	41.6	26.8	3.3	26.4	1.5	27.6		25.3	2	24.8	



PLANT 1 --THE CAMP VICARS POTATO FARM

THE PHILIPPINE *Agricultural Review*

VOL. IV

FEBRUARY, 1911

No. 2

CONTENTS AND ILLUSTRATIONS.

CONTENTS.

	Page.
Editorial	49
Fertilizers, by C. M. Conner, Assistant Director of Agriculture.....	53
The Camp Vicars Potato Farm, by O. W. Barrett, Superintendent of Experiment Stations	65
Field Operations Against Rinderpest in the Provinces of Bulacan and Pampanga, by Archibald R. Ward, Chief Veterinarian	68
Some Suggestions for Poultry Raisers in the Philippines, by George Seaver	74
A Dangerous New Weed in the Philippines, by O. W. Barrett.....	82
Monthly Veterinary Reports	84
Monthly Crop Reports	86
Current Notes: The English Sparrow in the Philippines; Directions for Taking Soil Samples; Orange Growing in Batangas; Banana Diseases; Soil Inoculation; Notes on the Bagulo Experiment Station.....	91
Notes from Other Fields: Experiments in Mango Propagation; Tapping Castilleja Rubber; Banana Cultivation in Jamaica; Sugar Matters in Formosa; Sugar from Dried Cane	97
Market Reports: The Fiber Market.....	101
Principal Philippine Imports and Exports for November by the Insular Collector of Customs	102
Temperature and Rainfall for December, by the Director of the Weather Bureau.....	103

ILLUSTRATIONS.

PLATE I. The Camp Vicars potato farm.....	Frontispiece.
II. Potatoes grown at the Camp Vicars potato farm.....	Facing page— 66

TEXT FIGURE.

1. Directions for taking soil sample represented graphically.....	93
---	----

EDITORIAL.

GET THE CARNIVAL SPIRIT.

The fourth Philippine Carnival will be held from February 21 to 28 in the city of Manila. With the valuable experience that has been gained during previous Carnivals, and the spirit of hearty coöperation that prevails among all parties connected with this work, there is every reason to believe that the Carnival of 1911 will be an even greater success than those of the past three years.

Frequent mention has been made in the pages of the REVIEW of the increasing prominence that has been given each year to the industrial features of the Carnival. Last year the industrial side of the Carnival included, not only the usual Insular and provincial exhibits of the products of the Islands, but also a live-stock show, machinery demonstrations, illustrated lectures, and a series of agricultural conferences. These features will be repeated this year.

The agricultural conferences held last year were eminently successful. Arrangements have been perfected to hold a second series of conferences this year on February 21, 22, 23, and 24. At these conferences questions of vital interest to the farmers of the Islands will be discussed. All of the provinces have been invited to send delegates to the conferences and it is hoped that there will be a large attendance.

No effort has been spared on the part of the board of directors to make the Carnival of 1911 a success. It now remains for the people, not only of Manila but of the entire Archipelago, to give their hearty support to this work. Come to the Carnival yourself, bring your friends, and if you haven't it already, *Get the Carnival Spirit*.

THE USE OF FERTILIZERS IN THE PHILIPPINES.

There appears to be a prevailing idea that the agricultural lands of the Philippine Islands are wonderfully fertile, and that any general use of fertilizers in this country is neither necessary nor desirable. As a matter of fact, however, this idea does not represent the conditions that actually exist. It is quite true that there are enormous areas of land in the Islands where the virgin soil contains an abundant supply of plant food that has been stored up by nature for the production of future crops, but these vast, undeveloped areas do not represent what is ordinarily considered as our *agricultural land*. That part of the country which may properly be considered at the present time as the agricultural land is the land that has been brought under cultivation and which, in a large part at least, is now under cultivation. Such land in the Philippines, instead of being uniformly fertile is, ordinarily, very deficient in the supply of available plant food which it contains. This condition is to be expected when it is considered that crops have been taken off the land year after year, in many places for generations, with no return of plant food having been made.

The gradually increasing use of fertilizers in any locality usually indicates a corresponding improvement in agricultural

conditions in that locality. The use of fertilizers is an essential part of *intensive* farming. Instead of growing small crops on large areas the farmer learns to grow large crops on small areas, thereby economizing in labor, transportation, and in many other ways. Furthermore, the increasing use of fertilizers marks, not only a general improvement in the agricultural conditions, but also an improvement in the farmers themselves, for the intelligent use of fertilizers is one of the most complicated and difficult branches of agricultural work. The feeding of plants involves a knowledge of the plant and its requirements, of the soil and what it contains, and of the materials that are supplied as plant food in the form of fertilizers.

Owing to existing conditions the use of fertilizers, and especially of commercial fertilizers, in the Philippine Islands will probably develop slowly. The great majority of the farmers in this country have very limited capital, and such capital as they have is largely required for the purchase of draft animals to replace those that have been destroyed. With the elimination of rinderpest as a factor in Philippine agriculture, and the consequent restocking of the farms, there will undoubtedly be a large increase in the use of fertilizers.

In the present number of the REVIEW the subject of "Fertilizers" is discussed in detail by the Assistant Director of Agriculture. Three general classes of fertilizers are considered, viz, farm manures, green manures (leguminous crops), and commercial fertilizers. Each of these classes has its own particular place in the Philippine agriculture of to-day. There is no reason why the farmers throughout the Islands should not save and utilize, at practically no expense, such fertilizing materials as are produced on their farms. A much more general use of green manures than is practiced at the present time is also entirely practicable. The use of commercial fertilizers must necessarily be restricted for the present to those farmers who have, or can obtain, the capital required for the purchase of such fertilizers. The development of the sugar and tobacco industries, and the gradually suppression of rinderpest, thereby making more capital available, should result in a steady increase in the use of commercial fertilizers in this country, and a consequent improvement in our agriculture.

THE RINDERPEST CAMPAIGN.

Under the title "Field Operations Against Rinderpest in the Provinces of Bulacan and Pampanga" the chief veterinarian discusses in this number of the REVIEW a plan of campaign against

rinderpest that is now being given a thorough trial in the provinces directly north of Manila. For a number of years the fight against rinderpest has been carried on against overwhelming odds. With infection existing practically throughout the Islands, and with new outbreaks constantly occurring in widely separated localities, the small force of men available for fighting this disease has been able to do hardly more than hold it in check. The thorough "cleaning up" of any one province, which can only be done with a large force of men, has been in most cases impracticable.

The increase in the size of the veterinary force, together with the valuable assistance now given in this work by the Bureau of Constabulary, have made it possible to put into effect within limited areas the plan of campaign outlined in Doctor Ward's article. The results thus far attained by these means are most encouraging.

FERTILIZERS.

By C. M. CONNER, *Assistant Director of Agriculture.*

With the increasing interest in agriculture in these Islands the all-important question is how to increase the production of our fields at a minimum cost. Up to the present time little or no attention has been paid to the use of commercial fertilizers for increasing the yield. Commercial fertilizers may be regarded as an artificial stimulant in crop production just as the feeding of grain may be so regarded in the production of beef and pork. This paper has been prepared in order to answer many of the inquiries coming in relative to the use of commercial fertilizers.

Plants require food in order to grow and develop just the same as animals, except that the food which plants use is in a different form and is derived from the soil and air.

Plants will be small and give little or no fruit, or will be large and give a heavy yield of fruit, according to whether or not they can get plenty of plant food and sunshine. If the soil is rich and the plants are crowded, either by other plants of the same kind or by plants of a different kind, so that they do not get plenty of sunshine and air, they will be small and stunted. An improved variety of plants is the result of furnishing the plant with plenty of food and protecting it from other plants by keeping the ground clean and cultivated, just as an improved breed of animals is the result of good treatment. Improved plants or animals if neglected by man revert to their original type, or if they have been under domestication for a long period of time will probably disappear altogether, if not cared for by man. In order to grow the best plants it is not sufficient to protect them from other plants, but it is necessary to supply plant food of the proper kinds and in the proportions required by the plant. Some soils possess all the elements of plant food in sufficient quantities to develop the plant to its highest limit. Fertilizers will have no effect on such soils. However, there is a limit to the development of any plant; if there were tons of available plant food in the soil, a plant growing upon it can not

develop beyond its capacity any more than an animal having an unlimited supply of food would develop very far beyond the normal for that kind of animal. Most plants growing as nature places them do not develop to their limit for the reason that they are retarded by the presence of other plants or by the absence of plant food.

The elements which plants derive from the soil and which concern the farmer most are nitrogen, phosphoric acid, potash, and lime. There are other elements used by the plant, but, as a rule, they are found in most agricultural soils in sufficient quantities to supply the wants of the plants. The phosphoric acid, potash, and lime found in the soil came originally from the rocks. When rocks are exposed to the air they crumble and decay, the rains wash the fine particles down to lower levels and form what is known as soil. This decay or rotting of the rocks goes on continuously and the elements of plant food are liberated in this way and become available to plants. As soon as a sufficient quantity of soil is formed for plants to take root, small plants start growing on the soil and aid in the decomposition of the small particles by the secretion of certain acids by their roots. The mature plants fall upon the ground and add to the fertility of the soil already formed, if they are not destroyed by fire.

When the dead leaves and stems become incorporated into the soil they form humus. This term humus applies to any partially decomposed organic matter. The cells of the plant being partially decomposed act as a sponge in holding water, hence a soil rich in humus has a large water-holding capacity. Plants growing upon such soils during a period of drought are able to grow on account of the presence of this water in the humus, whereas they would probably die were there not humus in the soil. When this humus becomes thoroughly decomposed it adds to the fertility of the soil in that the elements stored up in the plants while growing become available for other plants as soon as decomposition takes place.

Soils will be rich in phosphoric acid, potash, or lime according to the composition of the rock from which they were formed. For example, if the soil is formed from limestone rock there will be an abundance of lime in the soil; if formed from rocks free from lime of course there will be no lime in the soil, and the soil is likely to be sour or acid; a soil formed from a rock rich in potash will naturally be rich in this element. Most clay soils are rich in potash, whereas sandy soils are usually deficient in potash. The nitrogen that is in the soil came originally from

the air. Nitrogen gets into the soil in several ways. The principal way is by the agency of leguminous plants, such as beans, peas, clover, etc. These plants have the power of collecting free nitrogen from the air by means of certain bacteria which live in the tubercles or nodules on the roots of the plant. This nitrogen is used by these plants in building up their tissues, but when these plants die the nitrogen that has been collected by the agency of these bacteria and stored in the stems, roots, and leaves of the plants becomes available to other plants growing upon the soil as soon as decomposition sets in. Nitrogen gets into the soil also by being washed down from the air by rains after it has been formed into a nitrate by the electricity in the air, such as lightning. Soils containing large quantities of organic matter are usually rich in nitrogen. However, plants can not make use of this nitrogen locked up in the organic matter until it has decayed. As mentioned above, decay is hastened by exposing the soil to the air, hence frequent plowing will make the elements of plant food available more rapidly than if the soil were allowed to lie undisturbed. The fertility, or the ability, of the soils to produce large crops, can not well be determined by chemical analysis. Chemical analysis, however, will determine whether or not elements such as nitrogen, potash, phosphoric acid, or lime are deficient or totally lacking in the soil. Walker in his "Sugar Industry in the Island of Negros" makes this point very clear and is quoted here:

Now, in 1 hectare of land, from the surface to a depth of 20 centimeters, or the average depth to which the cane roots penetrate, there are 2,000 cubic meters of soil of an approximate apparent specific gravity of 1.5, or 3,000,000 kilos. One-hundredth of 1 per cent of this, the smallest difference which can be detected by an accurate chemical analysis, would amount to 300 kilograms of any one element, so it may be readily seen that at least five, and more probably ten, years would be required before any depletion of the soil from successive crops of sugar cane would be suggested by chemical analyses, even if absolute accuracy in sampling and in analytic methods were assumed, not to mention the greater changes which might be brought about during such a long period of time by mineral matter carried up from greater depths by the soil water, or carried away by rains.

These figures make no pretense at even moderate accuracy, but serve to illustrate the relatively small order of magnitude of changes in the composition of a soil which may be brought about by the cultivation of sugar cane. It is likewise apparent that the ordinary commercial fertilizers would need to be used in quantities of many tons to the hectare before any improvement in the soil as regards its actual composition could be detected. This should not be construed as an argument against

the use of fertilizers, for they are undoubtedly at times of great benefit, even in very fertile soils, but the way in which they act and indications for their use, although the matter has been carefully studied for many years in all parts of the world, are very little understood.

Cameron states the most modern views on this subject as follows:

Soil chemistry is a very complex subject, into which we are just beginning to get glimpses, and the supply of mineral nutrients is only one of the important details in a very intricate problem. * * * It is of course patent to everyone that fertilizers sometimes, in fact frequently, produce larger crop yields. Sometimes the contrary is true, but it is absolutely certain that at the present time no one can, nor are there any methods available by which one can, safely predict what fertilizers and how much should be used.

Plants require their food in certain proportions. A soil may be rich in *one* of the elements and still be called a poor soil. For example, a soil may be deficient in nitrogen and the crops growing upon it would be poor, whereas there might be a sufficient amount of available phosphoric acid and potash to grow a crop twice the normal size, provided that the nitrogen was supplied. This same statement may be applied to the other elements of fertility in the same way. There is no way of determining whether or not a soil is deficient in these various elements without making a field test. In order to do this, select a uniform piece of ground and lay out eight one-tenth hectare plats, preferably twice as long as wide, prepare the ground thoroughly and apply chemical fertilizers as follows:

Plat.	Kilos.	Fertilizer.
No. 1 -----	20	Nitrate of soda.
No. 2 -----	20	Nitrate of soda.
No. 3 -----	12	Sulphate of potash.
No. 4 -----	12	Sulphate of potash.
No. 5 -----	10	45 per cent acid phosphate
No. 6 -----	20	Nitrate of soda.
No. 7 -----	10	45 per cent acid phosphate.
No. 8 -----	12	Sulphate of potash.
No. 9 -----	10	45 per cent acid phosphate.
No. 10 -----	20	Nitrate of soda.
No. 11 -----	10	45 per cent acid phosphate
No. 12 -----	10	No fertilizer.
No. 13 -----	12	Sulphate of potash.

This is on the basis of 600 kilos of a fertilizer containing 5 per cent nitrogen, 8 per cent phosphoric acid and 10 per cent potash.

Plant these plats with the same kind of seed and in the same manner, harvest and weigh the crop. The weight of the crop

will show the effect or noneffect of the fertilizer. This same experiment can be tried again by varying the rate of fertilizer used per hectare. Great care should be taken in applying the fertilizer and in weighing the crop or the result may be misleading. Corn, rice, or sugar may be planted on the plats.

Each element of plant food mentioned above serves a different purpose in the building up of the plant. For example, nitrogen is used in developing the leaf and stem of the plant. It should not be understood, however, that plants producing only leaves and stems need only nitrogen, but that nitrogen is more important to such plants than are the other elements of fertility, hence grass which is not grown for seed requires a larger quantity of nitrogen as compared with the other elements of fertility. Plants producing starch or sugar use large quantities of potash in the forming of this starch or sugar, hence such plants as sugar cane, manihot, potatoes, rice, etc., require liberal quantities of potash for their best development. Plants producing seed, such as wheat, corn, rice, etc., require large quantities of phosphoric acid. Lime is used by all plants more or less in building up the stem and body, or the woody portion of the plant.

Fertilizers, as generally purchased on the market, are prepared for certain classes of crops and in many cases for one particular crop, such as zacate, vegetables, sugar cane, fruit trees, etc. There are very few, if any, natural fertilizers that can be applied to growing crops with profit without the addition of certain other elements, in order to make a balanced ration for the plant, unless the soil should be rich in some one or more of the elements. Many of the materials used in making these mixtures are what may be called standard; by this we mean that they do not vary to any great extent in their composition and are frequently referred to by name in speaking of the composition of fertilizers. In order that the reader may be more or less familiar with some of these materials the following list is given, together with such explanation as may be needed in order that one may clearly understand the nature and composition of the material:

SOURCES OF SOME OF THE RAW MATERIALS USED IN THE
MANUFACTURE OF ARTIFICIAL FERTILIZERS.

NITROGEN.

Nitrate of soda.—This comes principally from the mines of Chile and is frequently known as Chile saltpeter. The raw nitrate of soda is mined, dissolved in water, and recrystallized.

It is fairly constant in its composition and usually contains about 16 per cent of nitrogen, but owing to the fact that it takes up some water in a moist climate only 15 per cent should be counted upon here. Nitrate of soda when dissolved in water is immediately available as plant food, hence it is known as a quick fertilizer. For this reason it is used as a supplement to other fertilizers; that is, whenever it is found that plants are suffering for the want of nitrogen a small quantity of nitrate of soda applied along the side of the rows will correct the deficiency at once. The effect of nitrate of soda can be noticed in forty-eight hours after it has been applied, in some cases. Plants suffering for want of nitrogen are light green color and when nitrogen is abundant they take a dark green appearance. As it is very soluble in water, it should not be applied during the rainy season, nor where there is an excessive amount of water, as it will become so diluted that the plants can not obtain the required amount. In handling nitrate of soda it should not be left exposed to the weather, as it takes up water rapidly and a large percentage will be lost.

Dried blood.—It contains from 10 to 12 per cent of nitrogen, but its composition is not constant and a guaranty of analysis should be called for before buying. It is a quick acting fertilizer and very effective.

Sulphate of ammonia.—This is a by-product obtained from the manufacture of coke. It contains about 20 per cent of nitrogen and when applied to the soil becomes quickly available as plant food. It should never be mixed with lime or basic slag, but should be applied separately or mixed with some other material that will not form an insoluble compound.

PHOSPHORIC ACID.

Acid phosphate.—The bulk of the phosphoric acid used is derived from phosphate rock. At present this rock is found principally in Florida, South Carolina, and Tennessee. The rock as mined is insoluble and, as a rule, is of little value as a fertilizer until reduced to a fine powder and treated with sulphuric acid. This treatment renders the phosphoric acid available to plants, and also forms considerable sulphate of lime or land plaster. Acid phosphates from ordinary rock contain from 12 to 18 per cent available phosphoric acid. Acid phosphates containing higher percentages of phosphoric acid are usually obtained by washing the soluble phosphoric acid out of the low-grade phosphate fertilizer and reinforcing the higher grades;

these are known as superphosphates. Superphosphates of this character may sometimes contain as high as 45 per cent of available phosphoric acid.

Bones.—Raw or steamed bones and bone charcoal are frequently used as a source of phosphoric acid. Raw bones contain from 3.5 to 5 per cent nitrogen and 20 to 25 per cent phosphoric acid. The composition of the bones varies according to the age of the animal. Practically all the phosphoric acid in bones is available as fast as the bones decay, hence bones to be of value as a fertilizer should be ground fine in order to hasten the decay. Steamed bones are preferable to unsteamed bones, as the steaming removes the grease, etc., which interferes with the decomposition of the bones to a slight extent. In order to make bone meal become available quickly it should be mixed with more or less lime.

Basic slag.—This is a by-product in the manufacture of Bessemer steel. The phosphoric acid content of basic slag ranges from 15 to 20 per cent. The phosphoric acid in basic slag is in what is known as the insoluble form, but when placed in the soil the phosphoric acid becomes available to plants. In using this material it should not be mixed with acid phosphate or sulphate of ammonia. Basic slag usually gives best results when used on sour soils.

POTASH.

Potash salts.—Practically all the potash now used in commercial fertilizer comes from the potash salt mines in Germany known as the Stassfurt mines. These potash salts are found in connection with deposits of rock salt. The forms of potash salts known to commerce are kainit, muriate, and sulphate of potash; there are other forms, but not in general use. Kainit is the raw product as mined and contains about 12.5 per cent of soluble potash and a varying quantity of common salt. Muriate and sulphate of potash are refined from the low grade salts as mined. Commercial muriate and sulphate each contain about 50 per cent soluble potash. It should be borne in mind that kainit and muriate of potash should not be used for fertilizing tobacco, as the chlorine injures the burning quality of the tobacco. As a rule muriate of potash is cheaper than sulphate, owing to the fact that sulphate of potash is used in manufacturing. In the Philippine Islands it is not advisable to buy anything except the muriate or sulphate, as will be explained later under the head of concentrated fertilizers.

OTHER MATERIALS.

Fish and fish scrap.—Fish have been used as a fertilizer for a long time. In many cases they prove quite beneficial to the soil where they can be obtained in large quantities. Their use should be supplemented by the addition of potash and such phosphoric acid as is necessary in order to make their use profitable. Dried fish scrap usually contains from 9 to 10 per cent nitrogen and 6 to 8 per cent phosphoric acid.

Natural guanos.—In many parts of the Philippine Islands large deposits of bat guano may be found which contain sufficient nitrogen, phosphoric acid, and potash to make it profitable to mine it, but the composition of these deposits of guano is so variable that a chemical analysis and actual test upon growing crops should be made before attempting to use them extensively.

Tankage.—This is the refuse from the slaughterhouse and usually contains scraps of meat, blood, bones, and other waste parts of the slaughtered animal.

The different brands vary more or less in composition, being usually deficient in potash. The chemical composition, however, should be known before purchasing any particular brand and its value determined according to the number of pounds of nitrogen, phosphoric acid, and potash it contains. Other things being equal it is better to use tankage than any other fertilizer, as the tankage decomposes slowly and the fertilizing elements are not leached out by heavy rains. It also has the property of improving the mechanical condition of the soil.

There is a tankage manufactured in Manila from dead animals which contains about 4 per cent nitrogen, 8 per cent soluble phosphoric acid, and 14 per cent insoluble phosphoric acid. There are other brands of tankage manufactured in Australia and the United States which vary in composition according to brand.

Farm manures.—Too much stress can not be laid upon the use of stable manure. While it is true that the composition of stable manure depends largely upon the ration fed to the animal, yet the addition of any stable manure to the soil will improve it, not only from the standpoint of the addition of the elements of fertility, but the improvement to the mechanical condition which will enable the plants to grow better even were there no fertility added. This fact is recognized in many of the old countries where land is scarce and the production of the crop must be increased. In many parts of India large herds of cattle are kept for the sole purpose of supplying manure to the fields.

Very few analyses have been made of farm manures in these Islands, but in order to give the reader an idea of their composition the following table is attached:

Average composition of the most important farm manures.

	Nitro- gen.	Potash (K ₂ O).	Phosphoric acid (P ₂ O ₅).	
			Total.	Lime (CaO).
Cow manure (fresh)	0.34	0.40	0.16	0.31
Horse manure (fresh)	0.58	0.53	0.28	0.21
Sheep manure (fresh)	0.83	0.67	0.28	0.33
Hog manure (fresh)	0.45	0.60	0.19	0.08
Hen dung (fresh)	1.63	0.85	1.54	0.24
Mixed stable manure	0.50	0.63	0.26	0.70

Use of leguminous crops.—Leguminous crops, such as velvet beans, mongos, and sitao planted upon the land, either occupying the entire area or planted between the rows of the growing crop, add nitrogen to the soil. As stated before, this nitrogen is collected by the plant through the agency of certain bacteria which live in nodules on the roots. It has been found that a crop of velvet beans weighing 9,605 kilos per hectare if plowed under and mixed thoroughly with the soil, will return to the soil 64.2 kilos of nitrogen; this is enough nitrogen to last any ordinary crop three years. The nitrogen contained in these vines, leaves, and stems is not immediately available to the growing crop, but as the vegetable matter rots, the nitrogen gradually becomes available and even in this climate where decomposition goes on rapidly the effect would extend over at least two growing seasons. By referring back to the cost of commercial fertilizer per ton it will be noticed that this 64.2 kilos of nitrogen has a commercial value of ₱57.78. In many of the cane fields of Louisiana, cowpeas which collect practically as much nitrogen per acre as velvet beans, are planted after every crop of cane in order to furnish nitrogen for the next crop of cane which is to be planted upon the land. In this way the cost of fertilizer is reduced and the yield of cane materially increased. There is no reason why a similar procedure could not be followed in these Islands.

Market value.—The market value of a fertilizer is determined by multiplying the number of kilos of nitrogen, phosphoric acid, and potash in one ton of the fertilizer by the price of these elements per kilo. The price of these elements is determined by taking such standard fertilizers as acid phosphate, nitrate of soda, and sulphate of potash and determining the cost per

kilo by dividing the price paid for these materials upon the local market by the number of kilos of the fertilizing elements in them. According to the present market price of these materials, nitrogen is worth 90 centavos per kilo, phosphoric acid is worth 25 centavos per kilo, and potash is worth 28 centavos per kilo. From these figures the value of any mixed fertilizer or any fertilizing materials may be determined. For example, a ton of fertilizer containing .5 per cent nitrogen, 8 per cent phosphoric acid and 10 per cent potash may be calculated as follows:

50 kilos nitrogen, at ₱0.90 per kilo, equals	₱45.00
80 kilos phosphoric acid, at ₱0.25 per kilo, equals	20.00
100 kilos potash, at ₱0.28 per kilo, equals	28.00
Bagging and mixing	7.00
Total	100.00

The use of concentrated materials.—Since a ton of fertilizer is valued according to the number of kilos of available nitrogen, phosphoric acid, and potash, the higher the percentage of each, the cheaper the transportation; take as an example kainit, which contains only one-fourth as much soluble potash per ton as does a ton of sulphate of potash. It costs ₱60 to transport 500 kilos of soluble potash in the form of kainit from Germany to the Philippine Islands, but if purchased in the form of sulphate of potash the cost would be only ₱15. The same would hold true in transporting 500 kilos of soluble potash from the bodega to the field. It would take just four times as many trips to transfer the 500 kilos of soluble potash in the form of kainit as it would in the form of sulphate of potash.

Filler.—When a ready-mixed fertilizer is sold under guaranty to contain a certain percentage of nitrogen, phosphoric acid, and potash, a certain amount of dead material known as filler has to be used to make it weigh one ton. Take, for example, a fertilizer containing 4 per cent nitrogen, 7 per cent phosphoric acid, and 8 per cent potash. In mixing this fertilizer nitrate of soda, 18 per cent acid phosphate, and sulphate of potash can be used. The amounts of the various materials required are as follows: A ton of fertilizer containing 4 per cent of nitrogen would contain 40 kilos of nitrogen. If nitrate of soda contains 15 per cent of nitrogen, it would take as many hundred kilos as 15 is contained times into 40, or 266 kilos of nitrate of soda. Likewise it would require 389 kilos of acid phosphate and 160 kilos of sulphate of potash. The total amount of materials required then is 815 kilos. In order to make 1,000 kilos, or one ton, it is necessary to add 185 kilos of dead material, such as dirt, sand,

etc., to bring it up to the 1,000 kilos. When the purchaser of fertilizers so mixed pays the freight on the dead material and pays for the handling of it from the bodega to his fields, he gets no return whatever for this outlay.

The source of the different elements required by plants mentioned above is of no importance to the plant itself. It is immaterial whether the nitrogen comes from nitrate of soda, sulphate of ammonia, dried blood, or any other source; or whether the phosphoric acid comes from acid phosphate, Thomas slag, bones, or fish; or whether the potash comes from kainit, muriate of potash, sulphate of potash, or wood ashes, so long as the material which carries the nitrogen, phosphoric acid, or potash does not also carry some element the presence of which may prove detrimental to the growing plant, the quality and flavor of the fruit, and in the case of tobacco, the burning quality.

The original plant food in the soil at the time that it is first placed under cultivation should be regarded by the farmer as a bank account, and he should not continuously draw upon it without returning something to the soil any more than he would expect his bank account to last indefinitely without adding to it from time to time.

There are many ways in which the farmer can conserve the fertility of his soil without necessarily purchasing artificial fertilizers. There are thousands of tons of nitrogen driven off into the air every year by burning the grass, weeds, leaves, etc., on the fields. If these could be returned to the soil, or if they could be piled in some convenient place and allowed to rot and then applied to the soil, the production of the fields could be increased in this way without any outlay. One can also increase the production of his fields by growing, whenever possible, leguminous crops, such as peas, beans, etc.

Home mixing.—The farmer may purchase the raw materials and make his own mixture, if he so desires, or he may purchase them already mixed in accordance with the requirements of his crops. The mixing of a fertilizer is not a difficult matter if all of the materials are fresh, but in this climate it frequently happens that acid phosphate, muriate of potash, and nitrate of soda will take up moisture from the air and when they dry again hard lumps may be found, which must be broken up or ground in order to make a perfect mixture. The ingredients may be weighed out according to formula, spread in layers upon clean hard ground, or better, upon a concrete floor, and shoveled over two or three times until the mixture is of uniform color. It should then be sacked and may be set aside until ready

for use. If large quantities of fertilizer are used, say as much as 50 tons, it would be well to order the fertilizer ready mixed, as mixing can be done more thoroughly on a large scale and about as cheaply as the farmer himself can do it.

Application.—A fertilizer should be applied to the soil in such a manner that the roots of the plant will come in contact with it as soon as the plant starts to grow and be able to use up practically all of the fertilizer that has been applied during the growth of the plant. In some cases where crops are forced this is not advisable, as the gains obtained in forcing the crop more than pay for the excess of fertilizer applied. Where crops are planted in rows it is better to apply the fertilizer immediately under the row before planting, or at the side soon after planting. It is much less expensive to apply the fertilizer before planting. Fertilizer may be applied with a drill drawn by cattle, or carabaos. Drills may be purchased which will distribute the fertilizer in one or two rows at one time. In case the drill is not available, the fertilizer can be distributed very evenly by hand. If the workmen are not familiar with the distribution of fertilizer, it is well to measure the rows, preferably in lengths of 100 meters, weigh out the amount of fertilizer that should be applied on a row 100 meters long, place this in a sack or bucket and let them distribute, being sure to spread it evenly in the row. After one-half day's practice of this kind they will distribute the fertilizer without either weighing, or measuring the distance, and put it on very uniformly. After the fertilizer has been placed on the ground it should be worked in with a plow or harrow of some description, so that it will spread uniformly through the immediate root-feeding area of the row. In case the crop is to be sown broadcast over the surface, then, of course, the fertilizer may be applied broadcast and harrowed in. In most cases it is immaterial whether the fertilizer is applied one or ten days before planting. Such fertilizers as cotton-seed meal or other organic substances used as a fertilizer, which are likely to ferment when they become moist, should be applied some days before planting, because if the seeds come in contact with this fermenting substance, they will rot. In the case of inorganic fertilizers there is no danger of the seed being injured, unless large quantities are used.

THE CAMP VICARS POTATO FARM.

By O. W. BARRETT, *Superintendent of Experiment Stations.*

For the past two years the subject of raising potatoes in the Philippines has attracted the attention of many people outside, as well as inside, the official circles, but thus far the public is still guessing, more or less, as to the degree of economy in the results obtainable under average conditions.

In the first place it is rather unfortunate that people from the temperate climates are accustomed to rely upon the potato as a necessary article for the table; here in the Tropics where various yams, cassavas, taros, and other root tubers are more nutritious and more cheaply grown than the potato, notwithstanding the advantage of using these tropical productions, the average American or European housewife prefers to pay three or four times as much for the imported tuber, even if it is watery, shriveled, or badly sprouted. The American soldier is no exception to the rule, for he insists upon the "Irish" potato at any cost as a part of his rations; and the sweet potato is rejected except as an emergency article of diet.

Japan has profited largely by these predilections and dietary habits, for the greater part (about 85 per cent) of the potatoes imported into the Philippines are grown in that country.

Not until the subsistence department established a wholesale production farm at Camp Vicars, Mindanao, had the experiment of growing potatoes on a large scale been attempted in the Philippines, though numerous successes in a small way had been reported.

This farm, now becoming famous throughout the East, has the largest potato field in the Orient. It is located on the south shore of Lake Lanao, at an elevation of about 1,000 meters. This altitude reduces the temperature to something comparable with that of the growing season of Maine, the famous potato State of the Union. The climate, aside from the temperature, is good although for potato culture it might be better if the rains were not quite so regular. This latter statement may seem paradoxical, but it must be remembered that in these days a field ab-

solutely free from blight and fungus diseases is probably unknown anywhere in the world (with the possible exception of Chile) and a too humid atmosphere with no "dry spells" may conduce to the spread of these pests. The soil of this farm is as near perfection as possible from the standpoint of its physical character; its principal fault, however, is the lack of nitrogen; this is explained by the fact that for many years previous the land had been in cogon sod, and this grass was regularly burned off by the Moros once or twice each year. This burning left no humus in the soil except that made by the dying roots; the mineral salts (ashes) were, for the most part, taken back into the soil, however, instead of being carried away by rains. The first problem then, at Camp Vicars farm, was what the soil required in the line of artificial manures to produce a good crop of potatoes; of the two methods of enriching the soil green manuring was obviously too slow to meet the requirements of the subsistence department and, therefore, the direct application of nitrogenous fertilizers was adopted as the quickest (though by far the most expensive) method. The soil itself being entirely of a volcanic character, was probably formed from the old lavas of the gigantic group of craters which probably occupied, ages ago, the present site of Lake Lanao. It is neither clay nor sand, but a happy-medium mixture of fine and coarse silt-like material made by the gradual breaking down or "decay" of the aforesaid grayish lavas. The subsoil is practically identical with the surface soil except that the slight amount of humus contained in the latter is absent in the former. In short, the soil is suited for withstanding droughts and yet sufficiently sandy to prevent stagnation of water in the soil; that is, it does not "wash" in wet weather and crack in dry like clay, neither does it immediately dry out like a sandy soil.

Thus far only a few varieties of potatoes have been tested at the farm, and it would probably not be worth while to test a large number of kinds at present. The bulk of seed used this season is of the Burbank variety grown in California; two or three varieties from Vladivostock have just been planted. The present area in potatoes is about 25 and may reach 35 hectares this season. The whole farm comprises some 700 hectares. An excellent idea, which is being carried out so far as possible, is the rotation of potatoes with legume crops; theoretically this plan would eventually reduce the amount of artificial fertilizers required to a very great extent, but since time is a great object in the turning out of the crops, it has been necessary to apply very large amounts of commercial fertilizers. It may

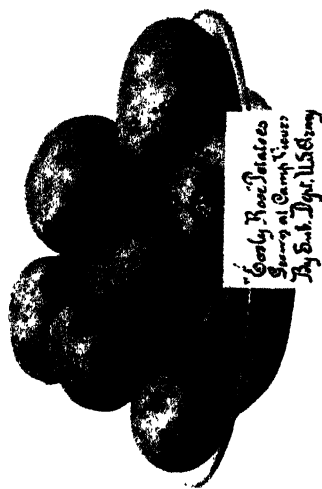
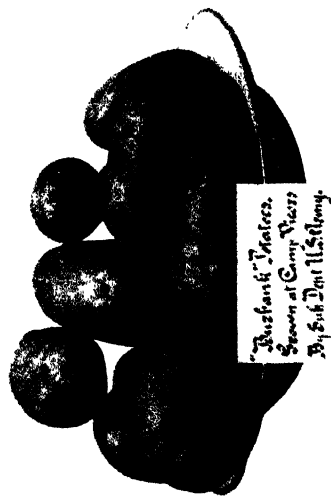


PLATE II.—POTATOES GROWN AT THE CAMP VICARS POTATO FARM.

be found possible to raise two crops of potatoes and one of beans or peanuts every twelve months by this rotation system. During the past season the largest plantation of Lyon beans (*Mucuna lyoni*) ever made was put out on the area now occupied by the potato fields, with the idea of "taming" the raw soil somewhat; these beans, like the Florida velvet variety, do not, however, produce a good growth the first season unless their bacteria assistants exist already in the soil at the time of planting.

It is impossible to prophesy definitely as to the degree of success which will attend the very praiseworthy efforts of the subsistence department, but considering the excellent soil, the location, the enthusiasm and ability of the present superintendent, Lieut. J. N. Walling, the present crop, unless unusually serious blights prevent, will probably be sufficiently large to convince all skeptics that potatoes *can* be grown cheaply and well here in the Philippines.

FIELD OPERATIONS AGAINST RINDERPEST IN THE PROVINCES OF BULACAN AND PAMPANGA.

By ARCHIBALD R. WARD, *Chief Veterinarian.*

Experience in combating rinderpest in the past has emphasized the necessity for concentration of effort within comparatively limited districts in order to bring to bear upon the work the necessary facilities for accomplishing the desired result. The difficulties of the work are such that it is quite impossible to ever have enough veterinarians and sanitary inspectors to find simultaneously all the centers of infection in these Islands, or to have sufficient guards available to control the disease when found.

The records of field work against rinderpest show large numbers of instances of success in eradicating it in small areas. Usually such gains are associated with corresponding losses in near-by localities, due to lack of a force sufficient to cope with the needs of the situation. The net result has been in general no gain in clean territory because the blows delivered have been insufficient to accomplish the work completely. The men were scattered, one, or at most two or three, in each province where rinderpest was known to exist.

When the necessity to concentrate the operations was recognized, the distribution of rinderpest was such as to indicate the desirability of beginning operations in the Province of Bulacan. South of this province the disease was known to exist on the Island of Luzon in only two centers in Batangas, on which as many men as could be used were at work. North of Bulacan the disease was distributed in Pampanga, Tarlac, Nueva Ecija, and Pangasinan to an extent not at all accurately known to representatives of the Bureau of Agriculture. Likewise an undetermined amount of infection was scattered through the Provinces of Nueva Vizcaya, Isabela, and Cagayan.

During the past few years rinderpest has appeared from time to time at various points in and between Bulacan and Pangasinan. Time and again portions of this territory have been reported clean, but at no time has the whole area been free from

the disease. Extensive trade routes radiating from Calumpit, and extensive movement of cattle and carabaos southward, are regarded as largely responsible for the instances of reinfection. At present the field work against rinderpest is carried on along the lines indicated in the following instructions to field men:

DEPARTMENT OF PUBLIC INSTRUCTION,
BUREAU OF AGRICULTURE,
Manila, December 12, 1910.

SPECIAL ORDER }
1910-11, No. 10. }

FIELD METHODS OF COMBATING RINDERPEST.

Present plans contemplate a campaign of total eradication in certain districts without the use of serum. Serum profoundly modifies the course of the disease, and sometimes masks the symptoms, which result is undesirable, as it prevents the discovery of the cases. The assembling of the animals for injection with serum also favors the spread of the disease.

It is desired that field work be directed primarily toward the restriction of movement of cattle from one locality to another. In the infected area and its immediate vicinity extraordinary efforts should be made to isolate each individual animal. If conditions prevent this, animals should be segregated in as small groups as possible. The assembling of the animals of a barrio on a common pasture should be prevented. Owners will be put to extra trouble, but should be induced to supply food and water of unquestionable safety. The method of combating rinderpest by the isolation of individuals and patrol of the district twice daily has given promising results in the field.

The extent of the areas in which the use of animals shall be prohibited must be left to the judgment of the veterinarian in charge. In cases where, in his opinion, animals are absolutely necessary for putting in a crop, barrios might be divided into small quarantine districts carefully and efficiently guarded, with frequent inspection of the animals. Make the extension of such privilege, where safe, dependent upon the character and extent of support by local officials. Yield as little in this regard as possible.

There are provinces where the force is hopelessly inadequate to carry out the foregoing recommendations at present. The policy in these places should be the application of palliative measures to keep down the death rate by use of serum. Under no condition should more animals be assembled than are actually in immediate contact with one another. Keep one man to spray the stocks after the injection of each animal. Better yet, assemble no animals from the immediate vicinity of a case.

Experiments at Alabang have shown that serum in doses of 100 cubic centimeters per animal, injected just previous to infection, will save a large percentage of Batanese cattle weighing from 175 to 250 kilos. Experiments with carabaos are in progress. There is no evidence, as yet, that the injection of serum weeks before infection will save the lives of the animals.

Men in the field must realize how difficult it is for the main office to lay down any definite rules for carrying on the work in the field. Regulations which are ideal to one province or locality are entirely inapplicable in other districts. On account of this, field work should be carried out in the spirit of these instructions, but modified, if necessary, to fit conditions.

G. E. NESOM, *Director of Agriculture.*

Many cases and outbreaks are not reported; representatives of the Bureau of Agriculture must search for them. To facilitate the discovery of cases arrangement is made with local officials to have all the animals of a barrio restrained at convenient points on a certain day for inspection. All suspected of showing early symptoms of rinderpest are tied where discovered until the diagnosis is completely verified to the satisfaction of the veterinarian in charge of the district, after which they are quarantined. This precaution avoids the danger of quarantining animals as a result of a mistaken diagnosis. When a case is verified all the cattle and carabaos that have been in contact with the disease are tied up for ten days to give time for the incubation of the disease. This is necessary because it may take fully this time for an animal to develop distinct symptoms.

Cases of rinderpest, after the verification of the diagnosis, are taken to a quarantine corral, great care being exercised to disinfect the dejecta deposited en route. The ground in the vicinity of a recently discovered case is thoroughly disinfected. Mudholes are likewise disinfected. The cases are kept in the quarantine corral under guard until the animals die or completely recover. Infected animals that survive are confined in the quarantine corral for thirty days after the attack. The corrals are built with a double inclosure of bamboo so constructed as to exclude small animals and chickens. The cases are cared for in the inner inclosure by a special attendant. The larger, outer inclosure is large enough to provide space for burying the dead. Fodder is brought by the owner to the outer fence and is taken in charge by the corral attendant. The corral and surroundings are kept scrupulously clean and the ground is sprayed twice daily with disinfectant. Upon leaving the corral the attendant disinfects his feet, hands, and all parts of his clothing which may have become infected. Care is taken to locate the corral on a spot where the drainage will not subject adjacent land to infection. Where necessary, the lot is surrounded by a deep ditch.

The restraint of movement of animals is the most important factor in measures against rinderpest. Experience has shown that a guard of Constabulary soldiers is the most effective means of controlling the spread of the disease from known centers of infection. Animals in immediate contact with cases are quarantined. Pigs, goats, and sheep are not allowed to run at large. The whole barrio is quarantined when disease exists within it. Movement of work animals within an infected barrio is prohibited in all cases when such measures do not conflict with agri-

cultural operations vital to the prosperity of the community. In quarantined barrios when the internal movement of animals is allowed, communication with the outside is permitted by transfer of freight across a narrow zone in which no cattle are allowed. Infected barrios are held in quarantine for ten to fifteen days after the death or recovery of the last case.

For present purposes the recent history of the disease in Bulacan may begin with the weekly report of September 17, 1910, when the province was reported clean. This may, or may not have been accurate, for one veterinarian was at that time responsible for both Pampanga and Bulacan. Even with the assistance that he had from an American and a Filipino sanitary inspector in the latter province the task was quite impossible to perform perfectly. A week later infection was found in two municipalities, involving four barrios. Coincident with the beginning of a systematic campaign of eradication in Bulacan, a ten days' quarantine for cattle and carabaos was established against Nueva Ecija and Pampanga, by provincial ordinance. On October 1 accession to the field force of one veterinarian and a Filipino inspector brought to light infection in another municipality, making the total barrios known to be infected four. For another month the field force was gradually increased to three veterinarians, one American and two Filipino inspectors, as they could be spared from elsewhere. In the meantime the number of infected barrios had risen to seven. The apparent inconsistency of an increase of infected barrios coincident with an increase in the field force is explainable by the fact that more men disclose more disease. A week later the field force consisted of two veterinarians, four American and four Filipino inspectors. This force augmented by the Constabulary was sufficient to make gains against the disease. The number of infected barrios remained at five during the three weeks ending November 19. On November 26 the infection was restricted to two barrios in the municipality of Angat. After December 7 no case occurred until January 5, when one was reported. It is interesting to note that this case occurred in the barrio where serum had last been used over a month before, and in fact the only one where it had been used for a long time.

As various barrios had been freed from disease in November, the men systematically searched the province for rinderpest. On December 1 there were seventeen men at this work, all of whom were trained to detect the disease. No further cases being found, on December 1 the main body of workers was trans-

ferred to Pampanga, leaving Bulacan still under the surveillance of four veterinarians and three Filipino inspectors.

To protect Pampanga from the danger of further infection from the north, quarantine was established against Nueva Ecija and Tarlac. Tarlac in turn established a quarantine against Pangasinan. Thus, a carabao traveling from Dagupan to Calumpit would consume thirty days in passing the various provincial borders. Travel by rail was likewise impeded. Cattle and carabaos were allowed to be unloaded in each province only at the northernmost station, where they were quarantined for ten days before distribution in the province.

In Pampanga the infected area had expanded from two barrios of the municipality of Mexico on September 3 until, on November 27, it involved seven municipalities. On December 3 thirteen men began the search for disease but only disclosed three new infected municipalities. During the week ending December 10 the disease was present in ten municipalities, involving sixteen barrios.

At this date the campaign was being waged by forty-one Constabulary soldiers, thirty-six municipal police, twenty provincial Filipino inspectors, nine native Bureau inspectors, nine American inspectors, and four veterinarians, one hundred and nineteen in all. On December 24 the force was increased by thirty-two Constabulary soldiers and two officers, together with more American inspectors. At this date the force at work consisted of one hundred and sixty men. As a result, on the week ending December 31 cases of rinderpest were present in only five municipalities, involving seven barrios. A week later the infection was discovered in another municipality, bringing the number of infected barrios up to ten.

Experience in Pampanga shows the necessity of concentrating forces, for the number of men there at present is barely sufficient to hold the disease in check and to scrutinize all the animals of the province in the search for disease. While progress in controlling known centers has been very satisfactory, new cases will be discovered from time to time and prolong the work. It will be a matter of months before it will be safe to regard the province as absolutely clean of the disease. When this conclusion is reached, the force will be moved northward and concentrated in portions of the territory in the Provinces of Tarlac and Nueva Ecija no larger than can be thoroughly covered by the force.

The prime consideration is to conduct the work with such thoroughness as to leave no infection behind. Experience with

rinderpest has been such as to make it reasonable to hope for such a result.

There are at present places to the north of the present field of operations where rinderpest is causing more loss than would be occurring in Pampanga if the force were entirely withdrawn. However, if rinderpest is ever to be eradicated from Luzon it must be done by extending the area at present free from infection and not by attacking the disease in widely separated localities. Labor in cleaning certain spots surrounded by infected areas would be wasted.

SOME SUGGESTIONS FOR POULTRY RAISERS IN THE PHILIPPINES.

By GEORGE SEAVER.

SELECTION OF STOCK.

The beginner should study the different varieties of poultry until he can select the one variety that suits him best, then make a selection and study that breed thoroughly and learn to judge of the good and bad points so that he may cull his flock intelligently. The Mediterranean breeds, such as white, brown, buff, and black Leghorns, and the Minorcas, both white and black, and Spanish, are doubtless best for this climate as they originate in warm countries, and are light, sprightly, and energetic. They are known as the egg varieties. The Leghorns are the standard by which the egg yield of other breeds are judged and occupy about the same position in the poultry industry as does the Jersey among cattle. But any standard variety intelligently handled is quite sure to be profitable, while to breed scrub or mixed breeds is almost sure to mean failure.

Careful and scientific breeding, and breeding only from the soundest, most vigorous specimens have produced in standard varieties stamina and vitality, greater resistance to disease, earlier maturity, and greater fertility than it is possible for any scrub to possess. Statements that the scrub is hardier or more robust than carefully bred thoroughbreds is erroneous and absurd. Of course, if one expected to give them no attention or turn them loose in a jungle to provide for themselves, the wild chicken would prove more adaptable, but given the same care and ration as domestic stock, the thoroughbreds will prove themselves stronger, more capable, and much more profitable.

EGG PRODUCTION.

Egg production is the most profitable branch of the poultry business, the returns being sure, quicker, larger, and more reliable, and as we import over ₱250,000 worth of eggs a year, the market is in no danger of being overstocked.

Different breeds lay different shaped, sized, colored, and flavored eggs. The varieties mentioned above lay large white shelled, fine flavored eggs, each weighing from $2\frac{1}{4}$ to $2\frac{1}{2}$ ounces. Many of the native game or scrub hens lay strong, rancid flavored eggs, owing to the infusion of the wild blood from which they are descended, and seldom eggs that weigh more than $1\frac{1}{2}$ ounces. The color of shell and yolk is seldom uniform, and it is rare for one of these hens to lay more than 60 eggs a year, while the Mediterranean varieties above mentioned will lay from 150 to 220 eggs a year, and commence laying when five or six months of age, while the scrub seldom lays under nine months. A Leghorn will lay three times as many eggs as the scrub and one Leghorn egg will weigh as much as two scrub eggs, of incomparably better color and flavor, uniform in size, color of shell and yolk, and consume no more food than the scrub.

If one starts with full-blooded fowls of any standard breed, it will always be possible to sell a considerable number of eggs for incubator purposes for which fancy prices may be asked and which will be readily paid. It is always best to guarantee satisfaction and if your hens are well mated and cared for you will seldom have to refund or make good. Selling high-class eggs for incubator purposes is the highest branch of the poultry business and should be treated accordingly. The buyer is trusting to the seller's honesty in delivering what is paid for, and relying on his judgment in mating his hens, so that to be successful one must act in good faith with his customers. It is always better to lose the price of a setting of eggs than to have a dissatisfied customer. The hens in mating pens should be strong, vigorous, well matured, and not less than a year old.

Select bright-eyed, energetic hens, wide across the fluff, long bodied, wings closely carried, head high, breast well up and full. With the egg or light varieties, one cock to fifteen hens is sufficient, although if two cocks to the pen are kept, letting them run with the hens on alternate days and spending the days off the run in a clean and light coop with plenty of food and water will pay for the extra labor in greater fertility of eggs, more vigorous chicks, and a longer period of usefulness for the cock. There is quite a steady demand for eggs for incubating all the year, but it is better to break up the mating pens in July, giving the hens all possible range, and mate them up again after the rainy season or about November 1, as the fowls have then about completed their molt. No eggs should be sold from the breeding pens till ten days after the cock has been in the run. Eggs for table use should be from hens hav-

ing good range and not mated. No cock should be allowed with any hens except the breeding stock. Hens will lay more and better eggs, and sterile eggs always bring better prices than fertile eggs in choice trade. They will keep better and have a more appetizing appearance when served.

Gather eggs frequently and deliver them as soon as possible to your customers; sell only clean and graded eggs, and the care they have been given will be repaid with interest by satisfied and contented customers, who will be only too glad to pay a good premium over the market price.

RUNS AND TYPE OF HOUSE.

Make the runs as large as possible. Small, bare runs will force you to feed green food as a substitute for grass and this class of feeding is never quite satisfactory. A chicken is one of the most adaptable of living creatures and if properly cared for may be raised and kept in a cage or coop hardly large enough to turn around in, but the care necessary to raise chickens is multiplied as you decrease the range. Small ranges must be kept clean and frequently spaded, and this is one of the first things neglected by the amateur poultry keeper, with disastrous results. Unlimited range is, of course, best, but if this is impossible, good grass runs are next best. Where green food must be fed, fill a bucket half full of palay, wet thoroughly, cover with a sack, and feed as needed after it has sprouted. Also feed green ground bone two or three times a week to all poultry in runs. If ground bone can not be obtained, scrap meat cut fine is almost as good. Care must be exercised to avoid ptomaine poisoning, as poultry is very susceptible to it with almost always fatal results.

Several types of houses have been tried and it seems that the most important thing—in fact, all that is required in this climate—is that the house be dry in the rainy season and furnish shade in the dry season. Iron roofs make the house extremely hot in the warm months unless placed high and ceiled. It seems that nipa makes the best roofing, being both dry and cool, but if once infested with vermin it will have to be destroyed.

Roosts should be near the ground, and the heavier the bird the lower the roost, as chickens flying from the roost to the floor frequently crack the bottom of the foot. This becomes infected, making the fowl very lame; frequently the entire leg becomes swollen and filled with pus, causing high fever and sometimes results fatally. This condition is sometimes called bumblefoot in the United States, often miscalled beriberi in the Philippines. For the light varieties the roosts may be placed 1.5 to 1.7 meters

from the floor, as they are more easily cleaned and worked under. A stick of timber 2 by 2 inches, with the edges rounded off, makes a good roost, and the nearer the ground it is placed the better. Dropping boards placed under the roosts make the work of cleaning out much easier and sanitary conditions much better. Roosts should all be the same height, otherwise the fowls will crowd to the highest roosts.

Nests are the next feature to be considered and are better placed low or near the ground and in the darkest part of the house. Different kinds of nests are highly recommended, but I have found nothing better than an empty oil case nailed to a post 6 inches above the floor, and part of the side taken off to make access easy. Tobacco stems make good nesting material as they keep out lice and mites and are very cheap, about ₱2 a thousand kilos at the cigar factory.

Hoppers, or self-feeders, have little to recommend them except the time saved in feeding, and frequently fowls injure their combs in greedy reaching after choice grains. A shallow box serves the purpose, is easily cleaned, and easy of access.

The earthenware base for large-sized flowerpots makes a fine water dish, is easily cleaned and inexpensive. Fresh water should be given every day and vessels washed clean.

INCUBATORS.

If one is going to handle poultry on a very small scale, it is possible to get along without an incubator, but it is almost impossible if large numbers are to be hatched or a plant of any size established. The machinery has not yet been made that will hatch as large a percentage of eggs as the hen, provided she attends to her business and does not die while setting, two conditions that have to be reckoned with. The incubator chicks are free from vermin when young, something that is practically impossible with hen-hatched chicks. Owing to the very slight changes of temperature in the Philippines and the humidity always present, artificial incubation is very easy. Any standard machine is sure to give satisfaction, and I doubt if there is an incubator made that would not work successfully under conditions here. No cellar or specially built house is necessary. Use the best oil, follow closely the directions that come with the incubator and do not spoil the hatch with overattention. Poor oil and too much attention spoil more eggs than all other causes combined. Handle the eggs as little as possible both before and after placing them in the incubator. See that the incubator sets level and place each leg in a can of water or the ants will kill the chicks before they leave the shell.

CARE OF YOUNG CHICKS.

After the chicks are hatched they should be left in the nest or incubator without food or water for twenty-four hours. Nature has provided for their first day's subsistence. The last act that the chick performs before breaking the shell is to absorb the yolk, which makes food unnecessary for at least two days, and dangerous if given before twenty-four hours, as the youngster must completely digest the yolk before adding to the food or white diarrhea will result. The first feed should be hard-boiled egg ground fine, shell included, and mixed with six times its bulk of oatmeal or rice bran (*tiqui-tiqui*). This food is continued until they are a week or ten days old, then feed them broken rice (*binlid*), or any of the crushed horse feeds sold in Manila. Artificial heat is not necessary in the brooder in this country. Put some soft straw in a box with a curtain across the open side, give them a grassy pen to run in, plenty of clean, fresh water to drink, and they will thrive. As soon as it is possible to tell the cockerels from the pullets, separate them; place all cockerels in a run by themselves, and allow the pullets all possible range. Cull the cockerels severely, keep only the very best and sell the rest for table purposes. Pullets should not run with the male until after the first molt, then, as they are something over a year old, chicks will be strong and vigorous.

FEEDING THE LAYING STOCK.

Only good, clean food should be given laying stock, but plenty of it, as there is little danger of a laying hen becoming too fat if she has a good range, and it is well to bear in mind that you expect her to deliver each day an egg containing over 2 ounces of highly concentrated food, and feed her accordingly. Vary the ration as much as possible, but be sure that she can get only plain, fresh, odorless food, otherwise the flavor of the eggs will be impaired; onions, garlic, or fish will very noticeably affect the taste of the eggs. It is unreasonable to expect a hen to furnish high-grade eggs when poorly fed, and if allowed to eat sewage, the eggs are not fit for human consumption. If the stock is confined in small or medium runs, special care must be used to give variety to the ration and supply green food. Sprouted rice, as before mentioned, is good and cheap, but lawn clippings can always be obtained and will be found of value.

It has been found advisable to keep dry mash for laying hens so that they may help themselves. Any of the crushed foods sold for horse feed in Manila are splendid poultry food as they contain crushed oats, cracked corn, wheat bran, cracked peas and beans and barley, about the balanced ration recommended by the Bureau

of Animal Industry of the United States Department of Agriculture. At present prices it will cost about ₱20 to feed a hundred hens of light breed a month on this feed. A mash may be made from rice products, rice bran, broken rice, and cracked corn that will do very well. It is cheaper than prepared crushed food, but not so good.

A box of charcoal should be kept in each pen, also broken shell, which may be obtained either from the button factory or fish markets at very small expense. Green ground bone is a very valuable addition to the feed, but should be fed sparingly, about 2 ounces to the fowl, two or three times a week. Fresh water must be given daily and drinking vessels kept clean. This is important.

DISEASES OF POULTRY.

Under this head may be outlined briefly the causes, symptoms, and treatment of such of the most common chicken diseases as have come to the writer's notice and a glossary of diseases that may be expected to affect the flock in this country.

ANÆMIA.

Cause: Lack of rich blood.

Symptoms: Comb and wattles abnormally white, limbs cold, fowl droopy and listless. Caused by poor food, unsanitary surroundings, overcrowding, and sometimes too much inbreeding.

Treatment: Clean yard and houses, disinfect, feed better food, introduce new males.

APOPLEXY.

Cause: Diseased condition of brain, too much blood, over-fatness, stimulating food, intense heat, derangement of digestive organs, overstrain in laying hens. Quite common in this country; not contagious.

Symptoms: Comb becomes dark red or purple, fowl staggers when attempting to walk, frequently falling from roost.

Treatment: Temporary relief may be obtained by pouring cold water over the head; shorten rations, omit pepper or condition powders, give purgative by putting a tablespoonful of Epsom salts (sulphate of magnesia) in every quart of drinking water. Most likely to affect show or pampered fowls.

BRONCHITIS.

Cause: Foul air, overcrowding, unsanitary conditions, exposure to heavy rain, damp houses. Not contagious.

Symptoms: Inflamed condition of bronchial tubes with quantity of mucus in throat, discharge from nostrils, eyes inflamed, difficulty in breathing, rattle in throat, and cough. This disease

is very similar to roup except that the latter has an offensive odor from mucus discharge. (If a disagreeable odor is noticed in handling the fowl, put it in quarantine or kill it immediately, as roup is very contagious.)

Treatment: Clean up, whitewash building, stop overcrowding, put a lump of gum camphor as big as the end of your thumb into every quart of drinking water.

DYSENTERY OR DIARRHEA.

Cause: Irritating matter in the intestines, sour and unwholesome food, exposure to wet weather, too much meat in ration.

Symptoms: Excessive looseness of bowels.

Treatment: Half a teaspoonful of castor oil, shorten ration, feed grain whole or coarse cracked grain, put a little alum in drinking water.

GAPES.

Cause: A small round worm with a smooth body and round pointed tail, and about 1 centimeter in length. They locate in the windpipe and cause suffocation. This disease generally appears after a rain, supposed to be connected with earth or angle worms as it almost always appears after worms have been eaten.

Symptoms: Generally affects chicks under three months. They will be observed to open their mouths and gape, which is accompanied with a choking cough and slight internal swelling of the throat. Very common and quite fatal in the Philippines.

Treatment: Wet a feather in turpentine and pass it down the bird's throat. One or two treatments will be sufficient.

FLAVUS OR WHITE COMB.

Cause: Parasite. Very contagious. Quite common in this country.

Symptoms: Small irregular white spots on comb and wattles that soon become confluent.

Treatment: Isolate all birds affected and bathe the parts in any good antiseptic, rub with carbolated vaseline.

ENLARGED LIVER.

Cause: Overfat, lack of exercise. Not contagious, very common.

Symptoms: Droopy appearance, lowering of wings, pronounced lameness in right leg.

Treatment: Starve for two days, sulphate of magnesia in drinking water, shorten ration.

ROUP OR CONTAGIOUS CATARRH.

Cause: Filth, cold and damp houses, foul drinking water. Very infectious; the worst poultry disease we have to contend with.

Symptoms: Same as bronchitis, except that roup has an offensive odor from discharge which becomes cheesy, and eyes and entire head are inflamed. Progress of disease very rapid.

Treatment: Unless the fowls are very valuable, destroy them as they become infected. Clean runs, disinfect houses, use water solution of potassium permanganate, inject full strength peroxide of hydrogen in nostrils, drop 1-grain quinine tablets into throat, also tablespoonful sulphate of iron to each quart of drinking water.

WARTS OR CHICKEN POX.

Cause: Unknown, generally considered to be a blood disease. Very contagious and probably causes more poultry loss in this country than all other diseases combined.

Symptoms: First, fever, or incubating stage, later followed by eruptions or warts on head, rapidly becoming confluent, frequently destroying eyesight.

Treatment: Mix $1\frac{1}{2}$ ounces flowers of sulphur with each quart of mash, sulphate of iron in drinking water, keep runs and houses clean, feed green food, and consider yourself lucky if you save 50 per cent of your growing stock. It seldom affects chicks over four months of age.

CONCLUSION.

The most important of all the factors that make for success is cleanliness. You may neglect every other requirement and, if lucky, escape serious results, but if filth is allowed to accumulate, failure is as sure as the passing of time. The dust bath is the fowl's method of keeping itself clean and free from vermin. Damp houses and wet runs are the cause of much sickness, as the hens will molt during the rainy season and the worst weather strikes them when least able to resist disease. July, August, and September are the months most likely to discourage the poultry keeper. When the molting season arrives, it is well to confine birds, and feed them very lightly for several days to stop laying. Then add a spoonful of oil meal or ground copra to the mash, and, after they stop laying, feed well. The flock will shed off and clean up together, and therefore present a better appearance. A little sulphur added to the food during molting season is good.

A DANGEROUS NEW WEED IN THE PHILIPPINES (SPREAD OF "LANTANA CAMARA" IN NEGROS).

By O. W. BARRETT.

This shrub, presumably introduced from Mexico along with many other tropical American weeds and ornamentals, has assumed, during the past two or three years, an alarming character. The seeds, carried by birds, remain viable for a considerable time and germinate whenever and wherever they find sufficient moisture, the young seedlings showing such vigor that they have little difficulty in outstripping the other weeds about them.

This plant, which gave the Hawaiian planters so much trouble a few years ago, is very likely to repeat its record as a pest in the Island of Negros, and probably in other locations in the Philippines. The superintendent of La Granja Modelo states in a recent report: "Where there were a few scattered bushes in this part of Negros two years ago there are now thousands. At this rate it will be but a few years before all of the uncultivated land in this province will be covered."

The attention of all landowners, where this shrub is now found, is called to this matter with the hope that they will at once attend to the eradication of the weed before it spreads beyond control. The process is simple, consisting in loosening the root system (which is fortunately very weak) by means of a pick, or even a strong wooden stake, and then chopping off the roots just below their union with the stem; the uprooted shrubs should be thrown into a pile and burned as soon as sufficiently dry.

This weed is easily recognized by its round, close, button-like head of reddish or yellowish flowers which are borne near the tips of the branches; the colors of the flowers in these roundish masses varies with their age; that is, an individual flower which opens in the center of the cluster is of a pinkish or yellowish shade but turns reddish or purplish after a few days as the cluster unfolds. The separate berry-like fruits;

only 3 to 6 millimeters long, become when ripe bluish or blackish in color and are eagerly eaten by birds; this latter fact is a very important feature in the rapid spread of this pest.

The plant lives an indefinite number of years, becoming eventually a shrub or bush some 3 to 5 meters high; most of the plants in evidence in Occidental Negros are only 2 or 3 meters high at present.

This weed is now being exterminated on La Granja Modelo, and it is hoped that similar action will be taken on all plantations where it has gained a foothold.

MONTHLY VETERINARY REPORT—DECEMBER.

The following provinces were considered free from rinderpest during the month of December, 1910:

Albay.	Cavite.	Samar.
Ambos Camarines.	Ilocos Norte.	Sorsogon.
Antique.	Ilocos Sur.	Tayabas.
Bataan.	Laguna.	Zambales.
Benguet.	La Union.	
Capiz.	Rizal.	

Surra was not reported in any of the following provinces during the same month:

Ambos Camarines.	Moro.	Nueva Ecija.
Antique.	Ilocos Norte.	Pampanga.
Bataan.	Iloilo.	Rizal.
Batangas.	Isabela.	Sorsogon.
Benguet.	Laguna.	Surigao.
Bohol.	La Union.	Tarlac.
Capiz.	Misamis.	
Cavite.	Negros Oriental.	

Eleven provinces may be considered free from rinderpest and practically free from surra. At present, the provinces suffering the greatest losses from rinderpest are Pangasinan, Oriental Negros, Leyte, and the Moro Province. Rinderpest has existed in two or three municipalities in Pangasinan for several months. Recently the number of infected municipalities in Pangasinan has been increased to 6. During the week ending December 31, 1910, there were 159 cases of rinderpest in that province. Sixty-five of this number were found during the week mentioned, while the others were old cases which had been discovered during the previous week. The total number of deaths from rinderpest during the week was 55. In the Province of Oriental Negros during the week ending December 24, 1910, there were 19 cases of rinderpest, 6 of which were discovered during the week. The number of deaths for that week was 11. In the Province of Leyte so few of the towns have telegraphic communication that it is impossible to give the exact number of cases and deaths during the last part of December, 1910, but former reports indicate the situation to be about the same as in Oriental Negros. There were, in all, 5 infected municipalities.

Undoubtedly, the recent losses have been heavier in the Davao district of the Moro Province than in any other part of the Philippine Islands. At present the number of deaths averages about 100 each week, and the infected territory includes a large area along the Gulf of Davao, north and south of the municipality of Davao.

On November 30, 1910, rinderpest existed in 50 municipalities and 16 provinces. On December 29, 1910, there were 41 municipalities and 16 provinces infected. At the time of going to press this number has been reduced to 36 municipalities and 13 provinces. On November 30, 1910, there were 19 municipalities and 10 provinces infected with surra. On December 29, 1910, this number had been increased to 21 municipalities and 15 provinces. During the past month the Provinces of Bohol, Bulacan, Nueva Ecija, Nueva Vizcaya, and Surigao have each had one municipality infected with rinderpest. In the Provinces of Cebu and Cagayan, there have been 2 infected municipalities, but very few cases of disease. Since December 31, 1910, there have been 9 municipalities infected with rinderpest in the Province of Pampanga, but in this province there has been a large force of men for the past two months, and the number of infected municipalities has been reduced to 5. In this province there has not been a large number of cases, and the disease has caused very little loss. Although surra has existed in a number of municipalities of the Archipelago, it has appeared only as occasional cases and has apparently caused no serious losses in any part of the Islands.

MONTHLY CROP REPORTS—DECEMBER.

ABACÁ.

Ambos Camarines.—The price of abacá is so low and the quality produced in this province is so poor that it hardly pays the laborers for getting it to market.

Tayabas (Marinduque).—A comparatively small amount of abacá was harvested during November on account of the rainy season and lack of transportation.

COFFEE.

Cotabato.—Coffee to the amount of 12 piculs was shipped from Cotabato during the month of November.

Mountain Province.—The barrios of Lubon and Sumadel lying in the country north of Cayan, and very seldom visited by Americans, are literally smothered in coffee trees. It is reported that as much as 500 cavans of coffee are sold from there each year.

CORN.

Cagayan.—The small amount of corn planted in the coast towns has yielded well. In Tuguegarao corn has reached the uncommonly high price of ₱4 to ₱6 per cavan.

Cebu.—The corn crop is being harvested in a number of different localities and is giving a good yield. Considerable corn on the west coast has been damaged by the extensive rains.

Iloilo.—In the southern part of the province a large amount of corn is now being planted on the hillsides.

COTTON.

Ilocos Norte.—The following areas are now planted to cotton: Vintar, 12 hectares; Piddig, 500 hectares; Laoag, 223 hectares; Paoay, 150 hectares, and San Miguel, 150 hectares.

Mountain Province.—The Ifugaos of Kiangan grow some cotton on irrigated patches from which the women weave a fine grade of cloth. The Bontoc, Kalinga, and Lepanto districts appear to be too high for cotton, as one never sees it in these subprovinces.

ORANGES.

Batangas.—The Tanauan orange crop has been one of the largest ever known. The greater part of the Tanauan country has been planted to young orange trees which are from 1 to 3 meters high.

RICE.

Bataan.—The rice crop in this province was nearly all cut and stacked by the 20th of December. The crop is reported to be about an average one with some fields short on account of the drought early in the season.

Bohol.—The rice plantations have suffered somewhat from windstorms, but no great amount of damage has been done. Rice planting is now going on in certain municipalities for the first crop of 1911.

Cagayan.—In the southern part of Cagayan Province the yield of rice is said to be much better than last year.

Cebu.—Owing to the abundant rains the rice crop now being harvested on the east coast will be heavy.

Cotabato.—Palay continues to arrive in Cotabato from the upper river country in large quantities and during the month of November 2,210 cavans were shipped by the Chinese merchants to Davao, Manila, and Dumaguete. One thousand four hundred and sixty-two cavans of rice, which had been cleaned in a rice mill at Cotabato, were shipped to Jolo and Manila. Considerable palay will be harvested during the month of December in the upper river country and the Malita River section.

Ilocos Norte.—Badoc possesses some of the richest rice land in the Province of Ilocos Norte. It is estimated that 3,590 hectares have been planted to rice this year. The farmers state that the rice crop in Badoc will be larger and of a superior quality to that of the previous year. Vintar stands second in rice production in the Province of Ilocos Norte. The records show that this town has 13,866 hectares of rice under cultivation. The crop in this town will be larger and superior in quality to that of last year. Piddig is raising some excellent rice. The records of the municipality show that 3,380 hectares of rice are under cultivation. The crop presents an excellent appearance and promises a larger yield than last year. Batac is the largest rice-growing municipality in this province. The records show 16,654 hectares of rice under cultivation. The crop presents a good appearance and promises a larger yield per hectare than last year. Laoag has little or no irrigation and for this reason produces an inferior quality of rice. The records show 3,118 hectares planted to this crop. The rice crop

will be larger and superior in quality to that of last year. Paoay has 2,000 hectares planted to rice which promises a larger yield than last year. San Miguel, on account of its location in the mountains, has a very small area of rice land. The records show 516 hectares planted to rice. The crop is in good condition and promises a larger yield than last year.

Iloilo.—The first rice crop, which should have been harvested in October and November, was a complete failure in the municipalities of Jaro, Santa Barbara, Cabaatuan, Janiuay, Pototan, and other places. The second rice crop, which will be 35 per cent short, will not be ready for harvest for some time, so that there is a period to be gone over with very little rice as compared with former years.

La Laguna.—The rice crop in the municipalities of Santa Rosa, Biñan, and Calamba, which was thought to be a failure, will furnish an abundant harvest. This is also true in the case of rice in other places in this province.

La Union.—Nearly all the rice crop has been harvested and the crop is a very good one. Many of the rice fields have been converted into tobacco fields, the planting of which is now in progress.

Mountain Province.—The harvesting of the rice crop is now finished and the Igorots are preparing the sementeras for the first planting of 1911, which will take place in January and February.

Tarlac.—Although Camiling, Concepcion, Tarlac, and La Paz have good palay, the crop for the province will be about 25 per cent short of last year.

Tayabas (Marinduque).—Harvesting of the rice crop was finished early in November and a fairly good crop was obtained. The planting of the second crop was started shortly after the first crop was harvested.

Zambales.—Nearly all the farming population in this province has been engaged in the harvesting of rice throughout the month of December. In the northern half of the province where beardless rice is practically the only kind planted the harvest is nearly completed and the grain in the stack. In the southern half of the province there are many Ilocanos who plant the bearded rice, and the harvesting of this variety is only well begun. In general this "palay Iloco" presents a very good appearance. Nearly all the municipalities report at least an average crop and some a better crop than last year. In some localities the rice crop is reported to have suffered from the drought of July and August.

RUBBER.

Cotabato.—The Rio Grande Rubber Company purchased 10 tons of gutta-percha during the month of November, and are shipping the same direct to London. The Chinese merchants during the month of November exported 835 piculs of gutta-percha and 4 piculs of rubber. During the month of November the Rio Grande Rubber Company received 50,000 Para rubber seeds from Singapore, and on November 25 the work of planting these seeds in the nurseries at Reina Regente was commenced.

SUGAR CANE.

Batangas.—There is a fine outlook for a big sugar crop.

Cebu.—The sugar crop is good but late. Cutting has not yet commenced.

Ilocos Norte.—The following areas are now planted to sugar cane: Badoc, 25 hectares; Vintar, 25 hectares; Batac, 190 hectares; Laoag, 1,047 hectares; Paoay, 200 hectares, and San Miguel, 108 hectares. The crop is in good condition.

Iloilo.—The grinding of sugar cane is being delayed by the continuous bad weather. The sugar planters are feeling somewhat dejected over the low price of sugar, it having fallen to ₱5.25 for No. 1.

La Laguna.—The cane fields of Santa Rosa, Biñan, and Calamba promise large yields, and the farmers are jubilant over the prospects for an excellent sugar crop.

La Union.—Sugar making has begun in earnest and those who are not actually engaged in this work at present are preparing to begin at once. The sugar cane crop is being harvested in some localities. It is estimated that the total production for the province will be about 6,000 piculs.

Occidental Negros.—Owing to the recent typhoon more or less sugar cane has been damaged, reducing the yield in many parts of the province. Grinding has commenced in the major part of the province, but is being much hindered by the continuous rains.

Tarlac.—Harvesting of sugar commenced during the month of November, and everyone agrees that the crop is going to be unusually large. The acreage is considerably larger than it was last year, but there is some uneasiness about prices.

TOBACCO.

Cagayan.—Considerable tobacco has been planted during the month in spite of the unfavorable weather. Although there has been an almost continuous downpour of rain but little damage has been done by floods.

Isabela.—The tobacco crop is nearly all in the hands of the buyers and the money therefor is rapidly going into the hands of peddlers on the river. Echague tobacco is not yet sold. Seed beds are out all over the tobacco district. Internal-revenue agents are now busy among the growers in an effort to induce them to strive for a better quality of leaf and better methods of handling. There appears to have been sharper competition than usual among the tobacco buyers this year. Buying did not start as early as usual and is not yet completed. The tobacco growers have a good supply of corn on hand and are not going into the market with their tobacco as avidly as formerly. There appears to have been a more general disposition on the part of certain buyers to buy by quality than in former years. It is surprising to a newcomer to note how little of the large amount of money which annually comes to this province stays here. Rice and other necessities are sold during the year at usurious prices, rice frequently being sold at ₱15 and more per sack. In Naguilian, a town where 1,450 cedulas were sold this year, a tobacco buyer states that about ₱200,000 were received by the tobacco growers and that the year's sales of *anisado* will amount to ₱30,000 or ₱35,000.

La Union.—Tobacco is being set out and the late light rains have been very beneficial to this crop.

MISCELLANEOUS CROPS.

Mountain Province.—In Tagudin the president is doing good work in having seed beds made from which he distributes plants to all who deserve and want them. Such methods bring better results than distributing the seeds promiscuously. It is noticed that tobacco and tomatoes are set out in quite large patches here. Present indications point to a successful year agriculturally for 1911. It will mark the real beginning of agriculture on a more or less scientific basis. Of course it will take some time for the natives to reach a satisfactory stage along this line, different methods will have to be applied to different sections, owing to climate, soil, etc., but the well-known patience of the Igorot will take him a long way along the road to success. It will mean to him better living, less work, and will give his boys and girls a chance for schooling, instead of their laboring in the sementeras as they do now from early youth.

CURRENT NOTES.

THE ENGLISH SPARROW IN THE PHILIPPINES.

After very nearly encircling the globe in its migrations, the English sparrow has become thoroughly established in the Philippines, and unless measures are promptly adopted to check the spread of this pest it will soon be impossible to exterminate the species by any ordinary means.

The following receipt for preparing a poisoned bait, as recommended by Mr. N. Dearborn, in Farmers' Bulletin 383, of the United States Department of Agriculture, is quoted here with the hope that all planters or owners of buildings in localities already infested by these birds will make use of it.

A poison mixture that has proved very effective is prepared as follows: Put one-eighth ounce of strychnia sulphate into three-fourths of a gill of hot water and boil until dissolved. Moisten $1\frac{1}{2}$ teaspoonfuls of starch with a few drops of cold water, add it to the poison solution, and heat till the starch thickens. Pour the hot poisoned starch solution over 1 quart of wheat and stir until every kernel is coated. Small-kerneled wheat¹ sold as poultry food, if reasonably clean, is preferable to first-quality grain, being cheaper and more easily eaten by the sparrows. A 2-quart glass jar is a good vessel to mix in, as it is easily shaken and allows the condition of the contents to be seen. If the coated wheat be spread thinly on a hard flat surface it will dry enough for use in a short time. It should be dried thoroughly if it is to be put into jars and kept for future use. Dishes employed in preparing poison may be safely cleaned by washing.

The poison should be well scattered so that many birds may be able to partake at the same time, since after a few are affected their actions excite the suspicions of their comrades. Usually a few sparrows get only enough strychnine to paralyze them for a few hours, after which they recover. It is important, therefore, to visit the feeding places two or three hours after distributing poison to prevent such birds from escaping. It is well also to remove dead birds promptly to avoid exciting the suspicions of those that are unaffected. In northern latitudes the best time to put out poison is just after a snowstorm, when other food is covered.

Sparrows should be baited in secluded places, safe from interruptions and where doves and poultry are not endangered. Roofs, back yards, and unused poultry runs are favorable situations. Proximity to low trees, grape arbors, and similar retreats has the advantage that sparrows go to

¹ Rice either husked or unhusked may be substituted.

such places between meals, and many dead birds will be found there well away from the bait. If undisturbed, poisoned birds will usually be found within a few feet of where the bait was spread, death occurring in from three to twenty minutes. Where doves or poultry are likely to be poisoned, the sparrows, after being baited, may be induced to feed in small covered pens made of coarsely meshed wire netting and having the sides raised about an inch and a half above the ground. There is practically no danger that cats or other animals will die from eating sparrows that have been poisoned.

Any wheat coated by the above process, which is overlooked by the birds, will become harmless after a few rains.

Sparrows can be reduced locally to almost any desired extent by the methods outlined above, but it should not be forgotten that such reduction can be made permanent only by systematic and continued efforts.

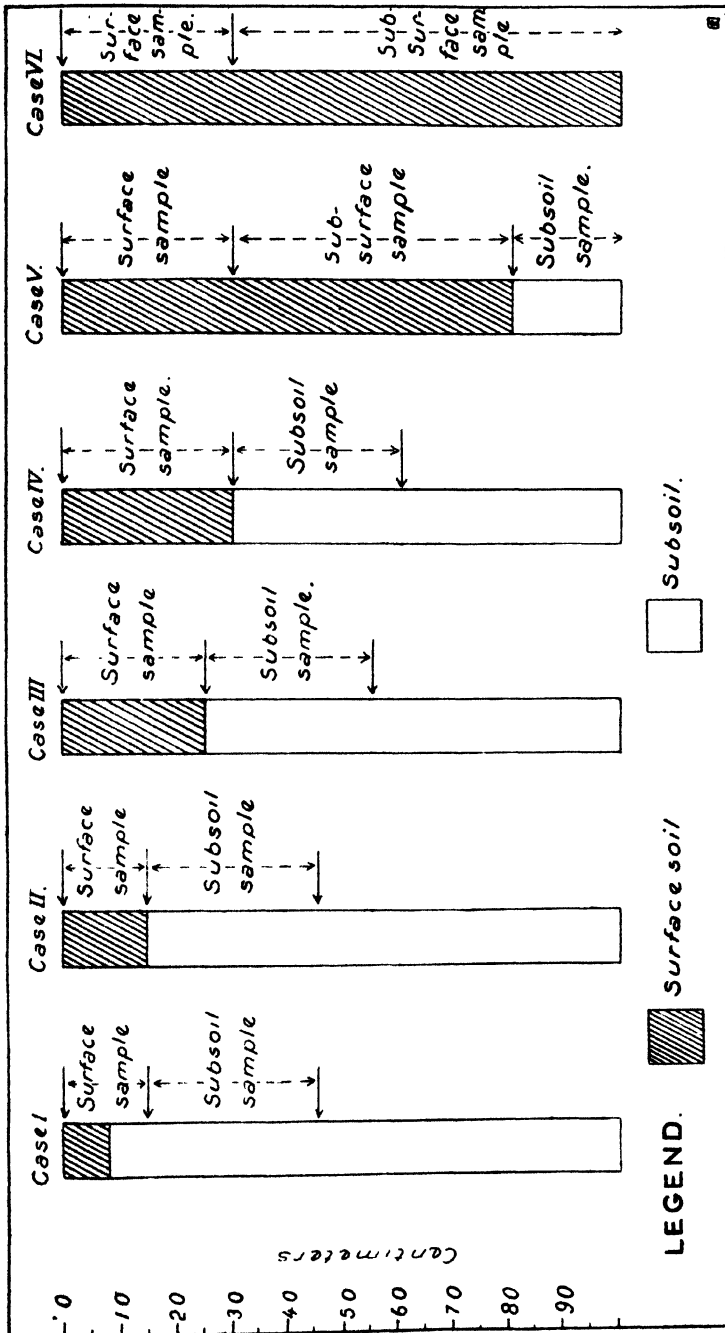
DIRECTIONS FOR TAKING SOIL SAMPLES.

Make a general inspection of the region, and select a representative field, i. e., one free from any modifications due to local conditions such as erosion, washing, etc. Inside the tract to be sampled, select five or six representative places, some distance from houses, fences, roads or trees and in cultivated fields midway between two plants, remove the surface accumulations of grass, leaves, or litter, and take samples with a soil tube or auger. A spade may be used if precautions are taken to dig a hole, one wall of which is smooth and perpendicular, to the proper depth and take the sample of soil from the side of the hole in a slice about 8 or 10 centimeters thick. Avoid mixing the layers of different depths. The sampling should be done preferably when the soil is reasonably dry, after the crop has been harvested and before fertilization.

Surface soil.—Sample each of the five or six spots chosen to a depth of 15 centimeters (6 inches) or to the change between the surface soil and subsoil, in case such change occurs between the depth of 15 and 30 centimeters, and place these together as representing the *surface soil*. *In no case is the sample to be taken to a greater depth than 30 centimeters (12 inches).*

If the surface soil extends to a greater depth than 30 centimeters, take a separate sample below the depth of 30 centimeters to a change between the surface soil and the subsoil, or to a depth of a meter if no change occurs. This sample of the *subsurface soil* should be obtained in other respects precisely like that of the surface soil.

Subsoil.—The depth to which the sample of subsoil should be taken will depend on circumstances. It is always necessary to know what constitutes the foundation of a soil to the depth of 1 meter at least, but in ordinary cases 25 or 30 centimeters will be sufficient for examination in the laboratory and should be taken in precisely the same manner as the surface soil.



Directions for taking soil sample represented graphically.

If the surface soil extends to a considerable depth below 80 centimeters, the sample of subsoil may be taken with less exactness, perhaps at some ditch or other accessible point, and its physical characteristics noted, i. e., whether a clay, rock, sand, etc.

Combine the borings of a given depth. Empty these large composite samples in turn upon canvas, oilcloth blanket, large heavy paper, or floor so as to protect the sample as much as possible. Break all lumps and mix thoroughly. Divide the sample by "quartering" and discard the two diagonally opposite quarters; mix the remainder and again quarter, repeat the process until only about $1\frac{1}{2}$ to 2 kilograms are left, and place in cans or in tight canvas or muslin sacks for the laboratory.

Each sample should have duplicate labels, one to be placed inside the bag and the other to be tied on the outside. A number may be marked on the bag and a descriptive letter prepared, but the label to be placed within the bag should, under no circumstances, be omitted. This process of taking samples may be modified as the exigencies of the work necessitate, but only those taken as above will be entirely satisfactory. Any departure from this method of sampling should be carefully noted.

Describe accurately the location of the field from which the sample is taken and the actual depth represented by each sample. It is often desirable to relocate a field and repeat the analyses after the fields are under irrigation or have been cropped for a long time. Add any statistics regarding the land as to crops, years under cultivation or since cultivation, etc., or any topographical information which is easily available.

ORANGE GROWING IN BATANGAS.

It has been estimated that the crop of oranges which is just being finished in the immediate vicinity of Tanauan, Batangas Province, has amounted to about ₱80,000 (f. o. b. value). The bulk (probably 85 per cent) of this crop is of the "naranjita" or seedling mandarin type. This is by far the largest crop ever exported from this vicinity, though it is possible as large crops have been *grown* previously; transportation by pack horses had always proved inadequate; the railway now solves the difficulty.

When we remember that this very valuable crop is produced on trees which receive no horticultural attention whatever as to pruning, careful cultivation, fertilizing, grafting, or protection from disease and insect enemies, the fact stands out as a most remarkable case of the planter *occasionally* succeeding *in spite* of himself.

There are probably a quarter of a million orange trees of bearing age in the so-called Lipa district.

It is interesting to note that in a very few cases the planters have just recently begun to plant secondary crops—peanuts, sweet potatoes, beans, etc.—between the rows of the young trees.

BANANA DISEASES.

The principal districts of Central America are now suffering very severely from the so-called Central American, or Costa Rican, banana disease. It is probably already in existence throughout the West Indies, and was discovered in September last in Hawaii by Mr. O. W. Barrett, of this Bureau. Should this disease gain entrance into the Philippine Islands it might reduce the quantity of bananas and plantains produced here by 75 per cent.

An apparently new disease has recently broken out in Bataan Province where it is destroying practically all of the plants in some centers. Unlike the Central American disease which begins near the heart of the plant and spreads centrifugally, the Bataan disease begins on the surface of the stem and spreads inward; the former is probably bacterial in origin, while the latter is due to the mycelium of a fungus.

Laws regulating the inspection of imported plant material should be put into force in the Philippines at once, for banana diseases are of but little account compared to some other plagues which are liable to be introduced here at any time, unless measures are taken for this prevention. It should be remembered, however, that the abacá industry would be threatened very gravely should any fungus or bacterial disease be allowed to spread among the bananas of the Philippines.

SOIL INOCULATION.

The Bureau of Agriculture has begun a coöperative experiment with the Bureau of Health along the line of soil inoculation for beans, peas, etc., that are now being grown in the vacant-lot school gardens in this city. The idea of establishing school gardens in vacant lots in different parts of the city originated with Dr. A. C. Garton, of the Bureau of Health, who is desirous of inducing the Filipinos to grow a variety of legumes for the purpose of supplying the almost utter lack of proteids in their present diet.

The experiment was initiated in a garden on Calle Nueva, Malate, and will probably be extended to two or three other gardens in other parts of the city. Check plots will be left in all cases to demonstrate the utility, if any, of this method.

The soil for these experiments was obtained from about the roots of old bean vines at the Singalong experiment station.

NOTES ON THE BAGUIO EXPERIMENT STATION.

Strawberries are doing excellently. A comparatively large amount of commercial fertilizer and lime has been used on them. There appear to be no fungus diseases nor insect pests.

The cruciferous vegetables are beginning to be badly infested with the cabbage butterfly. The experiment of reducing the number of the mature insects by netting was begun and apparently will prove practicable.

Tomatoes are badly affected with a fungus leaf disease. No traces of the black stem rot ("bacterial blight") have been noted. The second planting will probably prove more or less a failure this season.

On account of the recent dry weather all the beans are practically free from fungus diseases with the exception of the broad bean.

The peas at this station are in excellent condition.

NOTES FROM OTHER FIELDS.

EXPERIMENTS IN MANGO PROPAGATION.

Some interesting and important data with regard to shield-budding the mango are published in the Porto Rico Horticultural News for October (Vol. III, No. 10). Mr. P. J. Wester, who gives an account of the success achieved by Mr. Orange Pound, considers that his discovery marks an epoch in the mango industry. Mr. Pound, by his method, obtained over 85 per cent of healthy trees among a lot of 300 plants budded. We quote the following from Mr. Wester's account of the process.

Success depends on the prime condition of the stock plant and that the sap is flowing freely; the buds should be selected from well-matured wood that is still green and smooth, of the first, second, and third flushes from the terminal bud, and cut rather large, 3 to 5 centimeters long ($1\frac{1}{2}$ to nearly 2 inches). The lower, thick part of the leaf stem at the bud should not be trimmed off but allowed to remain on the bud until it is shed voluntarily. If the leaf stem, or petiole as it is also called, is cut too near the bud, fungi frequently gain entrance through the wound and destroy the bud. It is possible that the leaves can to advantage be trimmed off the bud-wood while it still remains on the tree and the bud-wood be used after the petioles have dropped and the leaf scars are well healed. It appears to be equally satisfactory to push the buds up or downward. To facilitate the insertion of the bud, it is well to trim off the edge of the horizontal cut. In tying the bud, allow the remnant of the petiole to stick out between the strands of the tape and protect it and the bud from the sun and rain with a square piece of wax cloth held in place by one of the strands of the tape above the bud. It is essential that the buds should be inserted at a point in the stock where the bark is of about the same age as the bud-wood, i. e., green and smooth, and the work done when the plant is in flush. When the union has been effected, which will be in the course of two or three weeks, the stock should be pruned off about 6 inches above the bud. The buds are sometimes very dilatory about starting, and in order to force them out the plants should, after the buds have taken, frequently be gone over and all adventive buds rubbed off.

In top-working old seedling trees the same principle obtains. Part of the main branches are then pruned off to 1 to 2 feet from the trunk and the resulting sprouts are budded and treated in the manner already described. As the buds increase in size the native top is gradually removed; care should be taken, however, not to prune the tree too severely at one time, as it is then apt to become permanently injured and die from such treatment.

TAPPING CASTILLOA RUBBER.

The Journal of the Jamaica Agricultural Society for October (Vol. XIV, No. 10) contains an article by Mr. L. A. Wates giving some conclusions he has reached in the course of tapping *Castilloa* rubber trees in Portland. It is stated that experiments were made on 37 trees varying in age from 8 to 14 years, and in girth from 20 to 65 inches, with the soil poor and unsuited to rubber cultivation. One of the trees, about 15 years old, growing on a stony, red, hot soil, gave 25½ ounces of rubber at the first tapping. Mr. Wates accounts for this in two ways: First, the tree always had its trunk shaded by shorter trees, causing the bark to grow thicker, and thus giving a larger surface of latex-bearing tissue; second, at some time in its young growth the tree was topped, causing it to fork, giving larger girth near the ground and available for tapping. In each case the forked trees gave best results, leading him to the conclusion that topping trees at 12 feet is advisable.

The tree yielding 25½ ounces at first tapping ceased to give latex at the end of three months, after being tapped at regular intervals of thirty days. After a rest of four months the tree yielded 7 ounces, and up to date the tree had yielded 41 ounces. In connection with his other experiments Mr. Wates concludes that a tree on moderate soil at 8 or 10 years of age should be at least 40 to 45 inches in girth, and yield 4 or 5 ounces of rubber at the first tapping. But frequent tappings of *Castilloa* by methods used for *Hevea* are useless, and it is the opinion of the writer that trees should be tapped either three or four times a year at equal intervals, and that growth and girth rather than age should determine the time for tapping unless conditions were equal and the age well established.

Methods of tapping and some of the difficulties to be overcome are discussed at some length. In conclusion, Mr. Wates says that taking into consideration the fact that these experiments were made on rubber trees growing in dry, marly, red dirt, in many cases on hilltops, or in open pastures, he is still of the opinion that *Castilloa* rubber growing may be a profitable enterprise.

BANANA CULTIVATION IN JAMAICA.

With regard to banana cultivation in Jamaica, Mr. H. Q. Levy, an agricultural instructor, makes the following statements in the Journal of the Jamaica Agricultural Society (Vol. XIV, No. 10):

This is the month (October) when all bananas should be suckered, and the suckering should be of a different kind to that done at any other time

of the year. It is now the time to make your final choice of suckers for the spring of 1912. The "peepers," i. e., suckers about 4 to 6 inches high that were left in July on first and second ratoons, should have grown to about 2 feet 6 inches to 3 feet high. All but one on each parent plant must be taken out. If bananas are planted 14 by 14, two may be left to each stool, if 12 by 12, each alternate stool should have two and the intermediate one a single sucker; distances closer than this, each stool should only be allowed one sucker. It is quite a mistake to crowd your field with suckers so as to get a large number of bunches; it is better to go on the selective principle, giving each root plenty of light and air, for it is only by so doing that there is any likelihood of the planter being able to bring in a spring crop after cutting the first or plant crop. In "plants," if the suckers are *well advanced*, or *fully grown*, which they should be by the second week of October, "peepers" ought now to be left, one to each sucker; if they happen to be backward, then taller suckers must be left. Old bananas and those that are thick and heavily shaded, should have sword suckers fully 5 to 6 feet high now. In all suckering, be careful not to have your 1912 "followers" on old stumps, or suckers, the fruit which will soon be cut. Such followers will only develop into "water suckers." Be also careful not to injure more roots than is absolutely necessary. Round-pointed cutlasses ought never to be used for suckering; they destroy too many of the main roots, and can not, in heavy soils, be pushed down far enough to kill the heart eye.

He goes on to say that October is not a good month for planting new fields of bananas. Those who live in the hills should plant later than those on the plains, for the atmosphere and earth remain cold longer. Consequently "bananas planted in October grow to a height of a foot or two and remain at that until February or March before making a fresh start, whereas those planted in February or March start right away, and never having had their growth checked or stunted, make far healthier suckers, and will be found to come in just as early, if not earlier than those planted in October."

SUGAR MATTERS IN FORMOSA.

The Yokohama Chamber of Commerce Journal, quoted in the Federal Reporter (Vol. XI, No. 10), gives an interesting account of the success attending the development of the sugar industry in Formosa. It is believed to have superseded all other industries not only in that Island but in all Japan, and many sugar companies are netting large profits. According to a late report, it is estimated that the production for the season will be 3,000,000 piculs, including 1,800,000 piculs of refined sugar and 1,200,000 piculs of red sugar.

The production of two large sugar companies estimated at 700,000 and 80,000 piculs, respectively, has increased to 770,000 piculs of the former and 100,000 piculs of the latter, the increase being considered due to the abundance of raw materials.

SUGAR FROM DRIED CANE.

A startling feature in sugar manufacture has recently attracted the attention of experts in Cuba and the United States. It seems that it has been found possible to crush and dry sugar cane so that it can be baled and shipped long distances without serious loss from fermentation. The advantage of this method, if it can be economically used, will be the extraction of a considerably greater amount of the sugar by the so-called "diffusion" process. However, it remains to be seen whether the increase in sugar from this method, and the advantage of cheap fuel such as natural gas, coal, etc., would offset the expense of long-distance transportation and the cost of drying.

We learn that 4,127 bales of dried cane were recently shipped from Cuba to Madison, Wisconsin, via Mobile, Alabama, with the object of testing this apparently impracticable method.

MARKET REPORTS.

MANILA HEMP RECEIPTS AND SHIPMENTS.

Telegram from Manila to London, December 26, 1910.

Receipts and shipments.	1910	1909
Hemp receipts at Manila since January 1.....	1,016,845	934,294
Hemp receipts at Cebu, etc.....	301,139	327,651
Hemp receipts at all ports since January 1.....	1,317,984	1,261,945
Shipments to United Kingdom by steamer, cleared since January 1.....	529,637	403,781
Shipments to Atlantic coast, United States, by steamer, cleared since January 1.....	467,369	599,881
Shipments to Pacific coast, United States, by steamer, cleared since January 1.....	105,555	121,321
Shipments to continental ports, by steamer, cleared since January 1.....	88,252	61,546
Shipments to all other ports.....	60,359	
Local consumption since January 1.....	11,000	
	71,359	54,622
Loading steamer on the berth for the United Kingdom, about.....	37,000	8,000
Loading steamer on the berth for Atlantic coast, United States, about.....	28,000	30,000
Shipments per sailer to Atlantic coast, United States, since January 1.....	20,650	21,730

Bales of hemp loading for United Kingdom, by steamers:

Erroll	22,000
Kilchatien	14,000
Fernando Poo	1,000

Total 37,000

Bales of hemp loading for United States, by steamer

Suruga	28,000
--------------	--------

Total 65,000

TEMPERATURE AND RAINFALL FOR AGRICULTURAL DISTRICTS IN THE PHILIPPINES.

By the DIRECTOR OF THE WEATHER BUREAU.

DECEMBER, 1910.

[Temperature and total rainfall for twenty-four hours beginning at 6 a. m. each day.]

Date.	Hamp				Sugar, Holllo		Rice, Tarlac		Tobacco			
	Albay		Tacloban.		Temperature.	Rainfall.	Temperature.	Rainfall.	Aparri.		San Fer- nando.	
	Temperature.	Rainfall.	Temperature.	Rainfall.					Temperature.	Rainfall.	Temperature.	Rainfall.
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
1.	26.3	16.3	26.7		26		27		25.6		24.8	
2.	26.6	39.5	26.2	69.4	26.8	21.8	26.2		26	7.6	26.2	
3.	25.3	44.3	25.4	42.3	25.4	24.9	25.6	7.6	24.9	5.1	25.7	5.1
4.	26.9	59	26.2	5.3	27.2		26.9		23.5	12.9	26.6	
5.	27.1	14	27	2.8	27.4	1.8	27.2		23.6	4.3	26.1	
6.	26.8	9.1	25.6	8.2	26.6		27		25.3		26.1	
7.	27	2.3	25.1	10.6	25	27.2	27.4		24.8		25.8	
8.	26.6	5.6	25	3.8	25.9		26.8		24.2		25.8	
9.	26.2	42.2	25.5	21.4	25.7	1.6	26.9		24	2.8	26	
10.	25.9	6.8	26	10.6	27.1		26.4		23.8	5.6	24.8	
11.	26.7	3.3	25.3	4.3	26.7	1.8	26.5		23.6	13.7	25.7	
12.	26.8	23.1	25.4	17.1	26.1	9.9	26.5	1.8	24.3	75.6	25	
13.	27	6.6	25.5	8.1	26.8		26.5		24.6	54.6	26.3	
14.	26.8	14.5	26.3	6.6	26.7		28.2		23.5	38.8	26.6	
15.	25.5	36.6	25.4	5.4	26.1	.3	28		22.8	31.4	26.8	
16.	26.6	61.2	25.7	1.8	26.5		26.6		22.6	2.3	26.6	
17.	25.4	21.4	25	15.8	26.1	5	27.8		23		25.9	
18.	25.9		25.3	.5	25.6		24.8		22		24.5	
19.	26.2	.5	25.4	2.3	26		25.1		22.4		24.6	
20.	26	.5	25		25.3		25.1		22.7		24.2	
21.	25.1	41.1	25.3	13.5	25.6	.8	25.4		22.6	6	24.1	
22.	21.9	4.3	24.7	65	25.4	.5	25.9		22.7	7.3	25	
23.	25.8	43	26.1	17.9	25.9	35.9	25.7		23	1.6	25.7	
24.	24.9	47	27.1		25.9	15.3	26.2		23.2		25.4	
25.	25.4	16.1	26.8		26.6	.3	25.5		23		25	
26.	26	20.6	26.8	1.8	27.3	1.3	26		23	.3	25	
27.	26.4	34	26.4	2.1	26.7	.8	26.9		23.5	2.5	25.7	
28.	24.6	84.2	27	4.1	26.6	.3	24.6	1.8	23.4		26.4	
29.	25	2.3	25.5	50.8	25.5	6.3	25.6		22.5	2	25.3	
30.	25.4	.5	24.2	24.2	24.8		25.4		23.3		25.5	
31.	25.2	3.6	25.5		25.4	1.1	25.7		23.1		25.2	

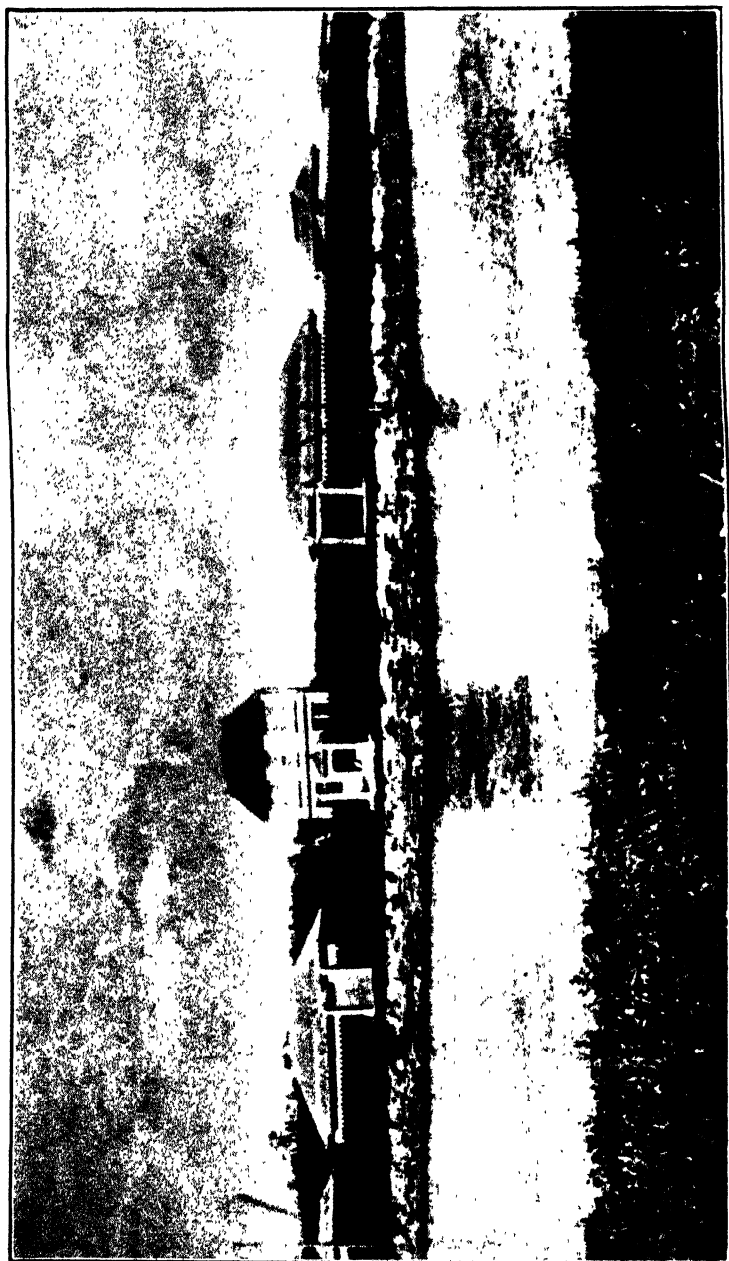


PLATE I.—QUARANTINE STATION USED FOR THE DETENTION OF IMPORTED ANIMALS AT YOKOHAMA.

THE PHILIPPINE *Agricultural Review*

VOL. IV

MARCH, 1911

No. 3

CONTENTS AND ILLUSTRATIONS.

CONTENTS.

	Page.
Editorial.....	106
General Order No. 19, The Disinfection of Boats and Railway Cars, by the Director of Agriculture	109
Brief Report on the Veterinary Institutions of Japan, by Dr R F. Knight, Assistant Chief Veterinarian, and Dr. C. G. Thomson, Superintendent of the Serum Laboratory	111
The Practicability of Supplying Native Beef to the Army, by Dr. G. E. Nesom, Director of Agriculture	119
Cultural Directions for Young Para Rubber, Extension Work Circular No. 3, by Mr. O. W. Barrett, Superintendent of Experiment Stations	122
Bureau of Agriculture Extension Work Lectures, by H. T. Edwards, Assistant to the Director of Agriculture.....	126
Agricultural Conditions in the Province of Nueva Ecija, by Sam H. Sherard, Agricultural Inspector	130
Monthly Veterinary Reports	139
Monthly Crop Reports	143
Current Notes: The Pangasinan Fair; Coconut Conditions in Laguna by O. W. Barrett; The Bacolod Fair; The Iloilo Fair; The Moro Province Fair; School Gardens in the Province of Antique.....	150
Notes from Other Fields: Orange Tree Culture; Copra Drying; Maize as a Catch Crop; The Development of the Sugar Industry in Hawaii	159
Market Reports; Notes on Manila Markets; Manila, New York, and London Fiber Market; Iloilo Sugar Market.....	162
Principal Philippine Imports and Exports for December and January.....	166
Temperature and Rainfall for January.....	168
Crop Reports for the Quarter Ending September 30, 1910.....	169
Range of Prices of Philippine Agricultural Products for the Quarter Ending September 30, 1910.....	172

ILLUSTRATIONS.

PLATE I. Quarantine Station Used for the Detention of Imported Animals at Yokohama	Frontispiece.
	Facing page—
II. Coconut Dryer Used in La Laguna Province.....	150
III. Native Coconut Oil Mill Used in La Laguna Province.....	152
101167	105

EDITORIAL.

VETERINARY WORK IN JAPAN.

During the month of November, 1910, the assistant chief veterinarian and the superintendent of the serum laboratory of the Bureau of Agriculture made a brief investigation of the veterinary institutions of the Japanese Government. This investigation was greatly facilitated by the very courteous assistance of both Japanese and American officials. A summary of the report covering this investigation is published in this number of the REVIEW under the title, "Brief Report on the Veterinary Institutions of Japan."

That the Japanese fully realize the importance of the live-stock industry of their country is shown by the enactment of wise legislative measures to protect this industry, and the establishment of modern and well-equipped veterinary colleges, laboratories, quarantine stations, and slaughterhouses. The stringent measures that have been used in eradicating rinderpest, and the effective manner in which this work has been accomplished by the Japanese are matters of vital interest to anyone who raises or handles live stock in the Philippines.

It is apparent that *thoroughness* is the keynote of all veterinary work in Japan. Every effort is made to work out sound theories, and when such theories are clearly established to put them into actual practice. As a result of this policy and of these methods, Japan has not suffered any serious losses from animal diseases during recent years.

OUR PROVINCIAL FAIRS.

The holding of provincial fairs in the leading provinces of these Islands marks the beginning of a movement amongst the people which if successfully carried on will be more significant and far-reaching in what it accomplishes for harmony, unity of ideas and sentiment on our fundamental problems of progress, amongst all classes of Philippine Society, than any other popular movement of a similar character since the organization of our present Government. This movement is the natural sequence of the educational and other work which has been carried on for the past ten years. The results of the half dozen or more provincial fairs which have been held in the leading agricultural districts of the country have been, doubtless, more far-reaching than can at present be realized.

Unity, coöperation, and confidence are perhaps the three most important words in our present Philippine problem. Without

these, as the warp and woof of our everyday life, the highest social, industrial, and commercial achievements—the greatest progress is impossible. The Filipino people have shown no lack in their social inclinations which have been marked by their love for *fiestas* and social gatherings. To-day we need societies and gatherings of all classes which have for their purpose some specific improvement of present social conditions, which will make all classes realize their common interests and their common dependence upon one another. Public sentiment, a common sentiment on the part of all classes of people, is necessary for the greatest progress and the greatest achievements.

The provincial fairs brought together hundreds of thousands of people of different languages and from different sections, but with a common interest in friendly contests and competitions, the benefit of which can not be overestimated. This was most strikingly illustrated in the Moro Province. The Moro Province Fair spoke volumes, not only for peace, but for the progress and prosperity of the people.

The educational value of these fairs has been demonstrated in many ways. They not only bring the farmers, merchants, and manufacturers together with the best products of their farms, shops and factories but they make them realize more fully their common interests; they reveal the resources available at their very doors and point out possibilities for the better development of these resources.

In 1909 the United States Department of Agriculture made the following announcement at the State fairs in the great corn belt of the United States: "Splendid as is our present corn yield, the corn crop of the United States can be increased in value by one hundred million dollars through a wise and careful selection of seed; it can be increased another hundred million by a better process of drying and sorting the seed selected; it can be increased another hundred million by a better care of the growing plant, and still another hundred million by a better care of the soil." Think of the significance of such a statement if the farmers were prepared and ready to act upon it.

The great masses of the people in the Philippines know very little and understand much less of the real significance and importance of the work being done by the Insular and provincial governments. In a previous editorial we called attention to the educational value and the importance of the exhibits of the Bureaus of Printing, Navigation, Internal Revenue, Public Works, Science, Forestry, and Agriculture, at the 1910 Carnival.

In the last report of the Director of Education we find this statement: "*It is perhaps not going too far to venture the assertion at this time that, within two or three years from this date, no State or national government will have in practical operation a system of industrial instruction more consistent than that of the Philippines in its sequence through the various grades, or more closely adapted to the material conditions and requirements of the country.*" In the same report the Director states that the Bureau of Education with its 10,000 employees in daily touch with almost half a million children, in nearly 5,000 schools, stands ready to assist in every way possible all governmental organizations—the Bureau of Health in instructing the people relative to sanitary measures and as to precautions against the spread of epidemics; the Bureau of Agriculture in advising the people as to the proper methods of soil cultivation, the varieties of plants specially adapted to the Philippines, and the circulation of information of agricultural interest. It is clearly our duty to assist the Filipino people in developing the resources which are available on every hand, but with such work by the schools, it is, furthermore, clear that there will soon be a demand on the part of the coming generation of Filipinos for us to guide them in the industrial and commercial development of their country. We can not doubt that these exhibits of work done in different towns and provinces will result not only in many of these industries being introduced into other towns where the natural resources are available, but in their improvement.

The friendly competition in the contests and exhibits at these fairs appeals to the pride which everyone has in his own ability and the work of his own hands. Fairs are, in a sense, a taking of stock, a popular industrial and commercial invoice of the natural resources of a section or district and of the actual progress and ability of the people in developing these resources for their highest uses, which points out the possibilities for future development and progress.

**GENERAL ORDER NO. 19, BUREAU OF AGRICULTURE.
THE DISINFECTION OF BOATS AND
RAILWAY CARS.**

By the DIRECTOR OF AGRICULTURE.

MANILA, P. I., *January 4, 1911.*

Notice is hereby given that the provisions of General Order No. 17, issued by the Bureau of Agriculture on November 8, 1910, are rescinded and superseded by the following:

1. Owners of railway cars and steamboats or other water craft are required to thoroughly clean and disinfect the same immediately after the discharge of each shipment of cattle, carabaos, sheep, goats, or swine. This cleaning and disinfecting shall be performed by the owners of the boats or railway cars or their agents, and in the ports of Manila, Iloilo, and Cebu it shall be carried out in the presence of the representative of the Director of Agriculture. At all places, except Manila, Iloilo, and Cebu, the cleaning and disinfecting shall be performed in the following manner:

(a) Remove all litter and manure which shall be burned, buried at least one meter below the surface of the ground, discharged at sea at least one mile from shore, or disinfected by thoroughly saturating it with a 5 per cent solution of carbolic acid, Jeyes' fluid, or some other reliable disinfectant approved by the Director of Agriculture.

(b) After they have been thoroughly cleaned, drench the sides and floors of railway cars and all parts of boats contaminated by cattle, with a 5 per cent solution of one of the above-mentioned disinfectants.

2. At the ports of Manila, Iloilo, and Cebu, all boats, railway cars, etc., shall be disinfected by the owners in the presence of a representative of the Director of Agriculture immediately upon the discharge of any of the above-mentioned animals, and such disinfection shall be performed in whatever manner the representative of the Director of Agriculture, at the port where

the animals are discharged, may deem necessary in order to prevent the spread of contagious animal diseases.

3. The provisions of this general order shall become effective on January 15, 1911.

G. E. NESOM,
Director of Agriculture.

Approved:

NEWTON W. GILBERT,
Secretary of Public Instruction.

BRIEF REPORT ON THE VETERINARY INSTITUTIONS OF JAPAN.

By R. F. KNIGHT, *Assistant Chief Veterinarian,*

AND

C. G. THOMSON, *Superintendent of the Serum Laboratory.*

ORGANIZATION.

The veterinary corps forms one of the divisions of the bureau of agriculture, which is under the administration of the minister of agriculture and commerce, and to it are assigned the inspection of meat, the inspection and quarantine of imported animals, and the control of contagious and infectious animal diseases. Although the improvement of equines is left entirely in the hands of the military department, the remainder of the animal husbandry work comes within the field of the bureau of agriculture, and so much has been done along this line by the importation of foreign stock that in some localities it is difficult to find an animal of pure Japanese blood. Numerous publications pertaining to the veterinary work and organization have been issued in the form of pamphlets and compilations.

RINDERPEST ERADICATION.

The work of the eradication of rinderpest in Japan by the bureau of agriculture is greatly facilitated by existing provisions, not only for the slaughter of animals affected with this disease, but also for those suspected of being infected. Quarantines are maintained against the districts where disease prevails by an efficient police force in such a manner that there is little danger of the extension of the area infected. As a matter of fact, however, the Japanese people have such a hearty respect for law and order that there are few attempts to violate any quarantine regulations that are imposed.

In addition to the slaughter of the animals affected and those directly exposed, and strict quarantine over the infected locality, the injection of antirinderpest serum is practiced upon the neighboring animals which are not known to have been directly

exposed to the disease. The Japanese officials believe that anti-rinderpest serum is valuable in stamping out an epizootic of rinderpest and that in the majority of cases a dose of 100 cubic centimeters can be depended upon to confer a passive immunity to the average animal for a period of two or three weeks. It appears that their conclusions regarding the value of antirinderpest serum have been drawn principally from literature. They use serum largely on those individuals which they believe are not exposed and where they do not expect the disease to appear. The fact that they do not have a large number of cases among animals that have been injected with antirinderpest serum seems to be due to the fact that very few of the injected animals are actually exposed. Their tests regarding the efficiency of this serum have been, so far as could be ascertained, the simultaneous injection of serum and virulent blood. It is believed that the simultaneous injection of large doses of serum will greatly reduce the percentage of mortality in animals that are given virulent blood, but this does not prove that the injection of antirinderpest serum will prevent an attack when an animal is exposed several days after the injection of serum. However, some of the Japanese, especially Dr. H. Tokishige, superintendent of the Institute for the Infectious Diseases of Animals, believe the injection of antirinderpest serum to be of little value except when used in connection with other measures, such as the slaughter of infected individuals and those directly exposed, strict quarantine of the infected district, etc.

During the past few years outbreaks of rinderpest in Japan have been largely due to the importation of disease from China and Korea. On several occasions they have suffered from small outbreaks which have been traced to these sources but these outbreaks have been speedily suppressed by stringent measures, and the country has remained free from rinderpest until another importation of the infection. Japan suffered its heaviest losses from rinderpest in 1896, for which year about 7,000 deaths are recorded. This infection was stamped out during the same year and no new cases appeared until 1899. Since then the disease has appeared from time to time through importations received from the mainland, but it has never seriously menaced the live-stock industry. At the present time Japan is entirely free from rinderpest, and to prevent the importation of contagious and infectious animal diseases the Government has installed quarantine stations at the principal ports and has issued stringent regulations governing the inspection and quarantine of animals received from foreign countries.

QUARANTINE STATIONS.

One of the quarantine stations, that at Yokohama, was visited. It is small, accommodating only about 50 animals, but as practically no animals except those for breeding purposes are imported at Yokohama, it is of sufficient size for that port. The quarantine station is located about 5 miles from the central part of the city and is situated on a small inlet so that live stock can be transported directly from the steamers to the place of quarantine.

The entire station occupies about three-tenths of a hectare of ground and is surrounded by a tight board fence about 3 meters in height. In the center of this area is a building of two stories, which is used by the quarantine officials as an office. Around this central structure are several other buildings used for the detention of animals. These buildings are constructed along sanitary lines, having concrete floors and electric lights. They are well ventilated and offer ample room and comfortable accommodation to the animals. Some of these buildings, those used for the detention of animals which may have been exposed to any of the diseases which are most commonly transmitted by flies, are provided with double screen doors and windows. In addition to these structures there is a small building located in one corner of the grounds for the isolation of suspected cases of disease, and another similar building which is used exclusively for post-mortem work. Bovines and other animals susceptible to rinderpest, imported from foreign countries where rinderpest is known to exist, are held at this quarantine station for twenty days after their arrival. In case rinderpest develops among any of the imported animals during the period of quarantine the entire herd is slaughtered and without indemnity to the owner. These regulations do not apply, however, to cattle imported for slaughter, as these are held in quarantine for two weeks only, after which time they are required to be slaughtered within three days.

SLAUGHTERHOUSES AND MEAT INSPECTION.

The cattle dealers and butchers are required to furnish men for slaughtering their animals and they are charged a moderate sum for the use of the abattoir (for cattle and horses, 1 yen¹ per head, and for hogs, 25 sen). The buildings connected with the Government abattoir at Tokyo cover about one-fifth of a hectare of ground which is inclosed by a board fence. On two sides of this inclosure are sheds for tying animals which are

¹ 1 yen=¥1; 25 sen=25 centavos.

awaiting entrance to the slaughterhouse. The hours for slaughtering are from 5 a. m. to 10 a. m. There is daily inspection before the killing commences of the clothing worn by the men working at the slaughterhouse and of all baskets and other utensils.

The Government inspection of meat consists of a careful ante-mortem inspection of the animals and a thorough post-mortem examination of the carcass. The ante-mortem inspection is conducted in a shed which is near the entrance of the main building and equipped with scales for weighing the animals. Near this shed is a building used as an office for the veterinarians and police officers in charge, and at one end of this latter structure is a laboratory sufficiently equipped to enable the veterinarians to make a microscopical examination of the abnormal tissues revealed by the post-mortem examination. This laboratory is supplied with glass jars and preservatives for the collection of interesting pathological specimens which are occasionally encountered.

The main structure where the butchering is performed, has a concrete floor with deep grooves running in two directions so that the fluids are carried into the main gutters without spreading over a large area of the floor. The walls to the height of $1\frac{1}{2}$ meters are enamelled tile. About one-third of this building is partitioned off for the dressing of cattle. These are skinned on the floor, and then by means of men and tackles, are hoisted to a track where they are eviscerated. A post-mortem examination is made in this room, and if no pathological lesions are found, the carcass is stamped and passed for food. If any abnormalities are revealed, the carcass is run into a separate room for a final examination and the viscera are carried into another room where they are placed upon a table and given a thorough examination in order to ascertain whether or not the carcass or any of its parts are fit for human consumption. A room adjacent to the main killing floor is devoted entirely to the cleaning of viscera. Hogs are slaughtered on the opposite side of this building and go through the same system of inspection as the cattle. Horses and other animals are occasionally slaughtered, but cattle and hogs form the principal means of supply. Condemned carcasses are taken from the slaughterhouse to the crematory, while condemned parts, such as lungs, livers, etc., are rendered sterile by boiling at the slaughterhouse and then used for fertilizer.

The Government slaughterhouses are under the supervision of the police department, and the stamps with which the quarters are marked bear the words "Inspected by the chief of the police

court." The bureau of agriculture inspects the meat and decides whether or not it is fit for human consumption. The remainder of the work at the abattoir is under the supervision of the police department.

The inspection of meat is very thorough, and all meat imported into the Philippine Islands bearing the stamp of the Japanese Government may be considered fit for human food unless affected by decomposition or other changes which have taken place after the inspection. At the Government abattoirs in Japan, a great many parts are condemned on account of the presence of animal parasites. Among those more frequently found are the *Echinococcus*, the *Strongylus Paradoxus*, and the *Distoma hepaticum*. The first of these often produces in the lungs a marbled appearance, which on microscopical examination somewhat resembles a lung affected by contagious pleuro-pneumonia. The last of the three mentioned is very common, and when this parasite is found the entire liver is condemned. Aside from the parasitic affections, tuberculosis is one of the diseases most frequently discovered. This disease is quite widespread in Japan, and the Government has taken important steps toward its control.

INSTITUTE FOR THE INFECTIOUS DISEASES OF ANIMALS.

In connection with the control and eradication of animal diseases, the bureau of agriculture maintains at Tokyo, under the direction of Dr. H. Tokishige, a laboratory well equipped for experimental work and the production of serums and vaccines. The scope of its work is indicated by the following table showing the quantities of various preparations produced there during the year 1909:

Antirinderpest serum	liters....	400
Anthrax serum	do.....	151
Anthrax vaccine	do.....	5
Tuberculin	do.....	33
Mallein	cubic centimeters....	725
Chicken cholera vaccine	liters....	40
Swine erysipelas serum	do.....	2.5
Antistreptococci serum	do.....	29

The preparation of serum for hog cholera and blackleg is being commenced, but up to the present time very little has been produced.

All the animals at the institute are inclosed in the same yard, so that great precautions are necessary to prevent the spread of the different diseases from one stable to another. For this reason animals are kept in fly-proof sheds which are so constructed as to readily permit a thorough disinfection. The

unnecessary passage of attendants from one building to another is prohibited, and all persons entering any part of the grounds, except the laboratory proper, are required to wear rubber boots which are immersed in antiseptic baths upon leaving any of the buildings. The institute covers about one hectare of ground and is inclosed by a high fence. About 35 animals are used in the production of antirinderpest serum besides a few others which were being held as virus carriers.

The general method of the production of antirinderpest serum is very similar to that which is being practiced in the Philippine Islands, but the process of immunization is a trifle slower. The animals are bled twice during a period of three days about two weeks after the inoculation of 700 or 800 cubic centimeters of virulent blood. No rules are laid down as to the number of bleedings which each animal is to undergo, but the treatment of individuals depends greatly upon the need for serum, the amount of virus available and other factors. As a rule animals are discharged after the second bleeding following inoculation of 3,000 cubic centimeters of virulent blood. The men in charge of this work claim that larger doses of virus do not give a corresponding reaction, but tend to be destroyed rather than absorbed. They maintain that the serum animals may be used for the production of serum indefinitely without any reduction in the potency of the serum produced. After being placed in stocks the animals are bled from the jugular vein by means of a trocar and canula, the blood being received into a cylindrical glass jar about 10 or 12 centimeters in height and of a capacity of about 400 cubic centimeters. After the blood is drawn these jars are covered by means of glass plates. They claim that a much better separation of bovine serum is obtained by the use of this type of jar than with tall cylindrical ones of a smaller diameter. After the separation of the serum from the solid parts of the blood, it is drawn from the jars by means of a pipette, and without filtration is sealed for delivery in brown glass bottles of 100 cubic centimeters capacity. It is said that abscess formation seldom follows the injection of this unfiltered serum.

They think that the strength of the individual has much to do with the efficiency of the serum, produced, and on this account they use only strong robust bulls as serum animals. Those which give a medium reaction to the inoculation of virulent blood are considered better for the production of serum than those which experienced a very strong or very weak reaction, as those giving a very strong reaction are believed to be weak

individuals. Before a serum animal is put into constant use as such his serum is tested on a calf and must protect the calf in doses of 110 cubic centimeters per 100 kilos against the simultaneous inoculation of virulent blood.

VETERINARY INSTRUCTION.

Besides maintaining quarantine stations and slaughterhouses, and laboratories for the preparation of sera and vaccines, the Japanese Government has gone still further and has established a veterinary course to prepare men for recommending and carrying out the sanitary principles for the preservation of live stock. The course is given in the Imperial University at Tokyo, and for entrance the completion of a course in one of the "higher schools" is required. The period of instruction covers three years of ten months each, and includes the principal subjects pertaining to veterinary and sanitary science.

The main building used by this course is occupied by class rooms, laboratories, and museums. The museums are especially well equipped, containing numerous specimens and models. The anatomical section contains skeletons of all domestic animals, models of the organs of special sense and viscera, and paper models of the head and limbs, showing the relative positions of muscles, nerves, bursæ, ligaments, and blood vessels. These models have been prepared by the professor of anatomy by means of plaster of Paris casts of dissected specimens, and are as natural and accurate as models could be made. In relation to horseshoeing, there are specimens and drawings illustrating the positions occupied by the bones in various attitudes of the horse. Horseshoes from various parts of the world are exhibited as well as shoes for correcting all abnormalities. Another section contains animal foodstuffs, both foreign and Japanese, and specimens of nearly all the medicinal plants. Models of horse stables and dairy barns, as well as models of the different breeds of stock, are used for instruction in animal industry. Besides the models and specimens already mentioned, the museum contains a large supply of pathological specimens which have been collected by the faculty.

At the rear of the main structure are three buildings used for hospital purposes. One of these provides stable room for about twenty large animals. Another is used as a small animal house, and contains accommodations for about forty cats or dogs. Both of these buildings contain consultation and operating rooms and are fully equipped with instruments and apparatus for clinical work. Horses are shod and clipped at the hospital,

the owners being required to pay a small sum for the expense incurred.

As a whole the veterinary course seems to be very thorough and up-to-date in every way, and compares very favorably with the courses given at the veterinary colleges in the United States.

CONCLUSION.

The Japanese have shown a clear understanding of the importance of animal diseases by the establishment of suitable quarantine stations and abattoirs, and of excellent veterinary colleges and laboratories for the study of subjects pertaining to veterinary work and the education of men to protect their live-stock interests. The enactment of wise legislative measures again demonstrates their realization of the importance of live-stock protection as well as a confidence in the men who are making a life study of this work. This realization of the importance of the live-stock industry and the confidence placed in the men capable of its protection, together with the determination of the veterinarians to put into actual practice all sound theories pertaining to the work, have in recent years, prevented animal diseases from causing serious losses. There are many points in the laws, methods, and institutions pertaining to veterinary work in Japan that are worthy the consideration of other countries.

THE PRACTICABILITY OF SUPPLYING NATIVE BEEF TO THE ARMY.

By G. E. NESOM, *Director of Agriculture.*

The December REVIEW contains an article entitled "The Forage Board and Its Work," in which is published an order issued by the honorable the Secretary of War under date of September 1, 1910. It may be noted that this order includes the following paragraph:

The Board will also consider the question of using wholly, or in part, *native* beef for the supply of the Army in the Philippine Islands.

The Forage Board reported on this question under date of January 10, 1911, to the effect that it would be impracticable to obtain a sufficient or satisfactory supply of native beef for the Army in the Philippines at the present time. The report, which goes into considerable detail and considers the question from a number of different points of view would not be of material interest to the general public. It contains, however, a few items of valuable information for both residents and nonresidents of the Philippine Islands.

The Forage Board considered only the *cattle* of the Philippines as available for beef supply as the carabao (water buffalo) is never used for slaughter except occasionally by the Filipinos and Chinese. The carabao meat is very dark and coarse and is not generally considered to be very palatable. Even the native cattle produce a much darker meat than that of the American and European breeds. The native cattle are also much smaller in size than the European types, the average dressed weight running a little under 100 kilos.

The Army is purchasing and using annually in the Philippines about 3,401,925 kilos of beef and 226,795 kilos of mutton, having a total value of about ₱1,350,000. The commissary department estimates that it would take about 32,000 native steers to produce this amount of beef. Statistics recently collected by the Bureau

of Agriculture show that there are in the Philippine Islands a little less than 250,000 head of cattle and nearly 750,000 carabaos, distributed as follows:

Province.	Cattle.	Carabaos.
Agusan.....	811	792
Albay.....	1,284	7,474
Ambos Camarines.....	1,873	12,590
Antique.....	5,671	14,254
Bataan.....	277	5,945
Batangas.....	35,176	12,924
Bohol.....	6,549	27,319
Bulacan.....	1,844	82,488
Carayan.....	10,626	29,122
Capiz.....	8,115	24,864
Cavite.....	8,110	8,932
Cebu.....	11,107	30,140
Ilocos Norte.....	6,033	29,766
Ilocos Sur.....	13,422	41,470
Iloilo.....	6,198	30,765
Isabela.....	2,358	20,502
La Laguna.....	1,786	12,170
La Unión.....	4,024	18,935
Leyte.....	6,740	19,814
Mindoro.....	9,953	4,290
Misamis.....	1,287	5,881
Moro.....	16,617	10,434
Mountain.....	15,772	11,707
Nueva Ecija.....	3,051	30,403
Nueva Vizcaya.....	1,223	4,117
Occidental Negros.....	10,895	33,196
Oriental Negros.....	3,779	12,291
Palawan.....	8,785	4,802
Pampanga.....	1,879	31,363
Pangasinan.....	12,708	72,056
Rizal.....	902	14,562
Samar.....	1,408	7,483
Sorsogón.....	6,049	10,604
Surigao.....	491	8,929
Tarlac.....	1,370	28,851
Tayabas.....	9,051	18,460
Zambales.....	1,869	9,400
City of Manila.....	389	2,158
Total.....	232,277	701,253
Add 5 per cent to cover animals which escaped enumeration.....	11,614	35,062
Grand total.....	243,891	736,315

It is a notable fact that a large percentage of the animals enumerated as cattle are work steers with a correspondingly small number of breeding animals. The constant tendency to use steers for work purposes instead of selling them for slaughter, and the necessity for meeting the local demands throughout the provinces for a beef supply reduces the supply which goes into the regular channels of trade to an almost insignificant number.

Manila is the principal market for native cattle; most of those received are of an inferior class and are slaughtered.

The cattle receipts of this port and the number slaughtered for the past four years are as follows:

Years.	Received from—		Slaugh- tered at Manila matadero.
	Foreign ports.	Philippine ports	
1906-7	35,649	2,431	24,301
1907-8	37,815	2,820	26,090
1908-9	36,298	2,165	31,180
1909-10	37,547	2,936	25,798

The amounts of cold-stored, cured, and packed meats and meat products imported into the Islands each year are generally in excess of the total value of the meat produced by the cattle slaughtered in Manila. The above facts show clearly that the Philippines are extensive importers of both live stock and meat products, and have no commercial supply to offer for sale in lieu of the present imports either for the Army or for the regular channels of trade. In this connection the attention of the reader is invited to the editorial contained in THE PHILIPPINE AGRICULTURAL REVIEW for January, 1911, which shows the possibilities of the Philippine as a grazing country as soon as the contagious animal diseases now menacing the industry are exterminated.

CULTURAL DIRECTIONS FOR YOUNG PARA RUBBER, EXTENSION WORK CIRCULAR NO. 3.

By O. W. BARRETT, *Superintendent of Experiment Stations.*

Removal from seed bed.—The plants should be taken up only during the rainy season. Unless the soil has been wet with rain the bed must be watered so that the earth will adhere more or less to the roots.

In most cases it will be necessary to cut or break some of the larger roots in removing the seedlings; if many roots are lost in this process it will be necessary to remove some or all of the leaves to prevent evaporation of the sap in the stem before new roots are formed.

The amount of balling which should be done will depend on the character of the soil, the age of the roots, the manner of packing, etc.; generally speaking, the more earth which can be taken up with the plant and packed firmly into a ball around the roots, the less the plant will suffer from the shock.

Whether transported in baskets, tins, or boxes, the seedlings must be protected from drying out and from exposure to the sun.

Seedlings having a height of 1.2 meters or more should be cut back to about 60 or 80 centimeters a few days before removing them from the nursery. The seedlings may be taken up when they have attained a height of 1 meter, and should never be allowed to reach more than 2 meters before transplanting; in special cases trees of 2 or 3 meters could be transplanted in favorable weather by cutting back to about one-half their height before transplanting. Care should be taken to prevent scratching or bruising the bark in handling the seedlings.

Planting.—Setting into the holes should be done after sunset or on rainy days.

The location of the plantation should be such that strong winds can not damage the trees. If there are no adjacent hills or forest trees to break the force of the wind, belts of trees, such as eucalyptus, coconut, bonga, or mango, should be planted around

and through the plantation before or at the time of setting out of the Pará trees. Rows of cacahuete (*Gliricidia maculata*) or ipil (*Lucaena glauca*) may be planted—the former by cuttings, the latter by seeds—as temporary protection, or in conjunction with other kinds, like bonga, coconut, and eucalyptus.

Sandy soils are dangerous on account of the quickness with which they become dry; low wet soils containing stagnant water can not be used, though some wet lands can be drained sufficiently to become safe. Localities which regularly suffer from droughts of more than a few weeks duration should be avoided unless adequate irrigation can be provided. Both alluvial and mountain soils are suitable provided they are always moist.

Holes.—The holes should be prepared two to four weeks before transplanting. They must be at least 1 meter in diameter; a depth of 25 to 50 centimeters is recommended. The subsoil, if poor, should be removed to a distance of at least 50 centimeters below the surface of the ground. In filling the holes only "top soil" (to a depth of 10 to 15 centimeters) about the holes may be used; care must be taken to avoid introducing grass roots or weed seeds with this earth. A few days before the Pará plants are set in, the holes may be filled nearly full to avoid delay and exposure of the seedling at the moment of transplanting.

Any broken or dead roots should be pruned off with shears or a sharp knife just before putting the plant into the hole.

The earth must be firmed in well around the roots so that there shall be no air spaces or lumps to cause trouble later. If the earth is not sufficiently moist the trees should be watered at the time of transplanting and, of course, as often as may be necessary *until they are well established*.

The proper distance between the holes depends upon local conditions and the plans of the planter in regard to secondary crops. If the plantation is on old cleared ground the trees may be set at 5 or 6 meters, whereas, on rich or recently cleared areas 7 to 9 meters would probably prove better especially if some secondary crop is to be grown during the first few years. There is no serious objection to setting the trees 6 meters providing the weaker trees are removed (tapped to death) as soon as they begin to interfere with the development of the vigorous individuals.

Cultivation.—At no time during the life of the Pará tree may grass of any kind be allowed to grow over the "feeding area" of the roots. The degree of cultivation given to the space between the Para rows will depend largely upon the local con-

ditions. As soon as convenient all brush, weeds, and grass should be eliminated. The surface of the ground, at least near the Pará trees, should be planted with beans or some kind of leguminous cover crop which will not only keep down the grass and weeds but will keep the area over the roots of the rubber comparatively cool and moist, and at the same time furnish nitrogen to the soil instead of poisoning it with root excretions, as in the case of grass.

Due precautions against fires must be taken.

No secondary crop like camotes, cassava, or bananas should be planted nearer than 2 meters from the Pará; after the third year from transplanting no secondary crop, except legumes, may be grown in the plantation.

The kinds of legumes recommended for planting as cover crops in the Philippines are: *Centrosema* bean; Lyon bean, yam bean, velvet bean, sword bean, and any of the native beans; cowpeas, mani manihan, peanuts, cacahuete, and ipil (*Lucaena glauca*).

The cacahuete, or baloc-balóc, is a shrub or small tree, especially recommended because it may be readily grown from cuttings stuck into the ground; it can be cut back whenever its height exceeds 1.5 or 2 meters, the removed branches helping to increase the humus layer on the ground. The habit of shedding its leaves for a few weeks in the dry season is a disadvantage in using this species: the ipil, or datels, is not deciduous.

If the soil becomes packed, i. e., so wet and clogged that air and water can not readily circulate through it, it should be forked by the vertical process, i. e., by trusting a strong-tined fork down into the ground to a depth of 10 to 15 centimeters, then, after loosening the tines, the fork is withdrawn without breaking the roots.

The young Pará trees must be protected from the depredations of pigs, deer, etc.; a woven wire fence is unquestionably the best means of protection. A very closely planted row of bonga palms (*Areca catechu*) can be utilized after about their fourth year as a live fence; bamboo strips may be woven into it and tied so that even pigs can not force an entrance; or maguey may be planted between the bongas very effectively.

If live mulches, or cover crops, are not used about the young rubber trees some kind of straw or leaf mulch should be kept over their roots except in very rainy weather. The layer of dry grass, rice straw, or similar material should be just thick

enough to prevent the growth of weeds without smothering the Pará roots; it should not touch the stem of the tree; it should be turned over occasionally.

All colonies of white ants (*Termes* spp.) in or near the plantation should be destroyed either by poisoning, fumigating, or "puddling."

All decaying wood should be removed from about the roots of the rubber.

(For further information on this subject address the Director of Agriculture, Manila, P. I.)

BUREAU OF AGRICULTURE EXTENSION-WORK LECTURES.

By H. T. EDWARDS, *Assistant to the Director.*

The extension-work lecture is one of the most widely-used means of disseminating information about agriculture. In many different countries trained men are now sent out by the Government through the farming districts to lecture before the farmers on improved methods of agriculture.

In the Philippine Islands, until recently, it has not been practicable to do any considerable amount of work of this kind. During the past five months, however, from August 10, 1910, to January 14, 1911, five employees of the Bureau of Agriculture have been detailed at different times for lecture work in the provinces. A total of 131 lectures has been given in 18 provinces. The total attendance at these lectures has been about 24,000 people. A part of these lectures has been given for the benefit of teachers attending the normal institutes held in different provinces by the Bureau of Education, while others have been for farmers, and the general public. Many of the lectures have been illustrated by the use of a stereopticon, and others by the use of charts, maps, seeds, and plants, and other illustrative material. In connection with the lecture work at the normal institutes the teachers and students have also been given practical demonstration work in the field and garden.

The extension-work lectures have covered a wide variety of subjects selected with reference both to the agricultural conditions in the different provinces, and the special requirements of the different audiences. Among the subjects discussed have been the following: "Seed selection," "Plant growth," "The vegetable garden," "Plant pests and diseases," "Some ways of improving a Philippine farm," "Rice," "Abacá," "Coconuts," "Tobacco," "Maguey," "Corn," "Farmers' clubs," etc.

The primary object of the extension-work lecture is to awaken an interest among the people in improved methods of agriculture.

At the close of each lecture the people present are requested to question the speaker and in this way discussions are started and new ideas are suggested. Wherever the lectures have been given a surprising degree of interest has been shown in them, and this field of work appears to be one that can be greatly enlarged.

The following is a summary of the work that has been done in the different provinces:

Antique.—Ten lectures were given in San José, Antique, from November 17 to 23, at the normal institute, by Mr. W. A. Mace. A lecture was given each morning to the high school pupils and in the afternoon to the Filipino teachers. One hundred and thirty high school pupils and 116 teachers were in attendance.

Bataan.—Five lectures were given at Balanga, Bataan, from November 28 to December 2, at the normal institute, by Mr. S. H. Sherard. These lectures, together with practical demonstration work given, occupied nearly the entire afternoon of each day.

Bulacan.—As the normal institute was not in session in Bulacan, five lectures were given in the municipalities of Malolos, Calumpit, Bulacan, San Miguel, and San Ildefonso, from December 12 to 16, by Mr. S. H. Sherard. Six hundred and fifty teachers and students attended these five lectures.

Cavite.—Fourteen lectures were given at San Francisco de Malabon, Cavite, from January 9 to 14, at the normal institute, by Mr. S. H. Sherard. One hundred and ten teachers were present.

Capiz.—Five lectures were given in Capiz from November 28 to December 2, at the normal institute, by Mr. W. A. Mace. One hundred and eighty teachers attended these lectures.

Three lectures were given in the municipalities of Capiz and Dao from October 20 to October 23, by Mr. M. M. Saleeby. Six hundred and seventy-five teachers, students, and farmers attended these lectures.

Two lectures were given in the municipalities of Capiz and Dao on October 20 and 22, by Mr. José Gomez. These lectures were attended by about 400 farmers.

Cebu.—Nine lectures were given in the municipalities of San Fernando, Sibonga, Argao, Carcar, Danao, Liloan, Naga, and Cebu, from November 7 to 16, before audiences of teachers, students, and farmers, by Mr. M. M. Saleeby. Eight of these lectures were illustrated with a stereopticon. The total attendance at these lectures was approximately 2,600.

Three lectures were given in the municipalities of Sibonga, Carcar, and Naga, from November 11 to 14, by Mr. José Gomez.

One thousand and one hundred people attended these three lectures, all of which were illustrated with the stereopticon.

Ilocos Norte.—Two lectures were given at Laoag on August 28 and 29 before the provincial high school and farmers by Mr. M. M. Saleeby. These lectures were attended by 130 teachers, students, and farmers.

Ilocos Sur.—Five lectures, all of which were illustrated with a stereopticon, were given at Candon, Narvacan, Vigan, and Sinait, from August 17 to 24, by Mr. M. M. Saleeby. These lectures were attended by 950 teachers, students, and farmers.

Iloilo.—Three lectures were given at Santa Barbara, Pototan, and Passi on October 17, 18, and 19, by Mr. M. M. Saleeby. About 1,500 teachers, students, and farmers attended these lectures. Three lectures were given on the same dates at the same places by Mr. José Gomez, which were attended by 1,500 people. These lectures were illustrated with a stereopticon.

Isabela.—Nineteen lectures were given at Ilagan, Isabela, from November 29 to December 24, at the normal institute, by Mr. Charles A. Mahan. These lectures were illustrated with charts, pictures, a tobacco-seed separator and a collection of seeds. The average attendance at these lectures was about 60.

La Union.—Six lectures, three of which were illustrated, were given in the municipalities of San Fernando, Bacnotan, Bauan, Naguilian, Balaoan, and Luna, from August 10 to 15, by Mr. M. M. Saleeby. About 900 teachers, students, and farmers attended these lectures.

Leyte.—Six lectures, two of which were illustrated, were given at Tacloban and Carigara, from November 20 to 25, by Mr. M. M. Saleeby. The total attendance at these six lectures was approximately 2,000.

Mindoro.—Mr. Sherard was at the normal institute in Calapan but one day, November 4. The entire day was devoted to a series of lectures and practical demonstration work. One hundred teachers were in attendance.

Occidental Negros.—Ten lectures were given in Bacolod, from December 6 to 12, at the normal institute, by Mr. W. A. Mace. Two hundred and sixty-four teachers were in attendance.

Oriental Negros.—Five lectures were given in Dumaguete, from December 19 to 24, at the normal institute, by Mr. W. A. Mace. One hundred and sixty teachers were in attendance.

Nueva Ecija.—Three lectures were given at San Isidro on December 19 to 22, at the normal institute, by Mr. S. H. Sherard. One hundred and ten teachers were in attendance.

One lecture was given at the Agricultural School at Muñoz on December 22 before 100 students of this school by Mr. S. H. Sherard.

Pangasinan.—Five lectures were given in the municipality of Lingayen from November 15 to 18, at the normal institute, by Mr. S. H. Sherard. One hundred and ten teachers were in attendance.

One lecture was given at Salasa on November 19, which was attended by 150 teachers and students and 75 farmers.

Sorsogon.—Five lectures, one of which was illustrated, were given in Sorsogon, from November 28 to December 1, at the normal institute, by Mr. M. M. Saleeby. These lectures were attended by 250 teachers and students. The total attendance for the five lectures was about 1,300.

AGRICULTURAL CONDITIONS IN THE PROVINCE OF NUEVA ECIJA.

By SAM H. SHERARD, *Agricultural Inspector.*

The Province of Nueva Ecija, lying north of Pampanga and Bulacan, east of Tarlac and Pangasinan, and south of the South Caraballo Mountains, has a mean annual temperature of 26.7° (centigrade), a population of 137,147, and a landed area of 2,169 square miles.¹ The soil is composed of shaley clay, black alluvial and sandy loams. This province is one of the first in the production of mangoes and about third in the production of rice, beside producing a considerable quantity of sugar and tobacco. The broad river valleys, extensive areas of grazing land, and other natural resources offer opportunities for great agricultural and industrial development.

AGRICULTURAL LANDS.

There are 90,367 hectares of farm land in the province, this area being divided into about 13,500 farms averaging 6½ hectares each. Of this farm land more than 29 per cent is cultivated, 11.4 per cent is in forest, and about 59 per cent is covered with cogon (*Imperata cylindrica*) and other wild growths. Rice, corn, sugar cane, tobacco, and mangoes are the principal crops grown by the farmers. It is estimated that more than 20,000,000 mangoes are harvested annually in Nueva Ecija.²

The province is divided naturally into three more or less distinct farming sections, namely, the southern, the central, and northern. The southern part of the province contains the rich lowlands of the Pampanga and Chico River Valleys, including the towns of Gapan, San Leonardo, San Isidro, Jaen, San Antonio, Cabiao, Zaragoza, Peñaranda, Santa Rosa, Cabanatuan, Aliaga, and Licab. It is rather thickly settled, and devoted largely to raising rice, sugar cane, corn, and tobacco. The rich lands in the Pampanga and Chico River Valleys are natu-

¹ One square mile equals 2.59 square kilometers.

² Census of the Philippine Islands: 1903.

rally adapted to raising sugar cane. The town of San Antonio is situated in the heart of a section which was in former years largely devoted to growing tobacco. The land further north, in Aliaga and Licab, is more exclusively devoted to rice raising. Rice and corn are raised in nearly every part of the province.

The central part of the province includes the uplands of the Pampanga and Chico River Valleys, one of the richest and most beautiful tracts of rolling prairie land, well watered and well wooded, to be found in the Philippine Islands. It includes the towns of Bongabon, with the large barrios of Nazaret and Santor which lie at the foot of the mountain range forming the eastern boundary of the province, Talavera, Santo Domingo, San Jose, and San Juan de Guimba with the large barrio of Muñoz where the Central Luzon Agricultural School is located. Though this section doubtless contains the best farm land in Nueva Ecija it is as yet but sparsely settled. At present only a small portion of this land is under cultivation; however, it is being rapidly homesteaded by people from other provinces.

The town of Cuyapo, which is situated about 240 kilometers (15 miles) northwest of San Juan de Guimba and about 32 kilometers (20 miles) west of San Jose, is in the heart of one of the richest farming sections on the Island of Luzon. This section includes parts of the provinces of Tarlac and Pangasinan, and the towns of Cuyapo and Nampicuan in Nueva Ecija.

In the town of Rosales in Pangasinan is located the well-known "Hacienda Esperanza." During 1909 a branch of the Manila and Dagupan Railroad was built from Paniqui through Nampicuan to Cuyapo giving the people in this section the advantage of Manila markets in addition to the best facilities for travel and communication. The opening of this line of railroad will tend to hasten the development of the towns of Nampicuan, San Juan de Guimba, and San Jose, which are located in the northwest part of the province. Cuyapo is one of the wealthiest and most progressive towns in Nueva Ecija.

The part of the province which lies to the north of San Jose is mostly table-lands of a rough, mountainous character. The northern boundary, the South Caraballo Mountains, is a lofty range. From the extremities of this range two ranges running northward fork out and include the fertile valley of the Cagayan River. About 21 kilometers (13 miles) northeast of San Jose, on the Pampanga River, is the town of Pantabangan, said to have an elevation of about 305 meters (1,000 feet) above sea level; here small patches of rice, potatoes, sugar cane and some coffee are grown. To the north of Pantabangan, about 24

kilometers, near the source of the Pampanga River is Caranglan, a small town of about the same elevation as Pantabangan, in which rice, sugar cane, and tobacco are grown. But few of the people in this section live outside of the *poblaciones* of Pantabangan and Caranglan, and the barrios of Lupao, Puncan and Salazar. Pantabangan and Caranglan are accessible only by mountain trails, consequently the farming is not very extensive. Most of the crops are raised for home consumption; however, there is some trade in deer meat and hides which are sold to the people living in the central part of the province. Between the towns of San Jose, Caranglan, and Pantabangan there are great rolling table-lands on which thousands of horses or cattle could graze. This country being situated at the foot of the mountains, having pure water, and being free from infectious animal diseases, would be a very desirable location for stock raising.

FARM ANIMALS.

Nueva Ecija, like other agricultural provinces, has suffered greatly from the loss of farm animals, more especially draft animals. During the months of January, February, and March, 1909, nearly every town in the province was infected with rinderpest; since that time the disease has been practically stamped out.

At first there was more or less trouble in getting the people to bring their animals into the *poblaciones* to be injected with serum, but lectures and talks on sanitary and quarantine measures were given and as a result their attitude has changed from one of suspicion to one of confidence in this work.

It seems that practically all of the carabaos in the Province of Nueva Ecija were brought from the Provinces of Ilocos Sur and Ilocos Norte. As this disease has appeared in animals from these places, in some cases causing death within three days after their arrival, it would seem that they were infected before they came. As a step toward the total eradication of rinderpest, it would be advisable to place a rigid quarantine on all animals brought into the province.

TRANSPORTATION.

The usual means of transporting agricultural products are by *carretones*, carabao sleds, and upon the backs of men. Owing to the fact that there are very few roads in the central and northern parts of the province, it is almost impossible to transport large quantities of produce to market. In these sections there are thousands of hectares of virgin land partially covered

with cogon and timber. The provincial government is constructing a good road from Cabanatuan, at the end of the railroad, to Muñoz. This road will open up to settlers a large section of country and furnish an outlet for farm products from San Jose and Talavera. The Cabanatuan branch of the Manila and Daguupan Railroad passes through the towns of Cabanatuan, Santa Rosa, Peñaranda, Gapan, and San Isidro, the provincial capital.

Instead of living on their farms, like American farmers, most of the farmers live together in barrios, or *poblaciones* where they remain at night and return to their fields in the daytime. This custom is practiced especially in those sections which are some distance from the *poblaciones* of the towns. The purpose of living together in communities is for protection from *ladrones* or robbers who usually live in the mountains. Since Constabulary soldiers have been stationed in the province, the people have shown a greater desire to live on their farms.

FARM IMPLEMENTS.

Like most provinces in the Philippines, the agricultural implements used in Nueva Ecija are of a very crude order, though on some farms modern agricultural machinery is used, the disk plow being most in evidence. The plow used by the ordinary farmer has narrow shares, shaped like wings. This plow penetrates the soil about 10 centimeters on irrigated lands, but on dry soils the farmer often finds it necessary to plow the land three or four times in different directions in order to cultivate to a depth of 25 or 30 centimeters. Beside these plows crude wooden harrows, rolling harrows, and small tools such as shovels, bolos, etc., are used on the farms.

PRINCIPAL CROPS.

Rice.—In this province many varieties of rice are grown, including lowland or irrigated, upland or nonirrigated, and mountain rice. Cultivation begins by preparing and planting the seed beds; this usually takes place during the first part of June. The preparation of the seed bed consists in clearing a piece of ground about 20 meters square, usually near a well or stream, and working it with a plow until it is saturated with water. A harrow is then passed over it in opposite directions to level the ground and to work it into a muddy mass. At the same time the seed is soaked in water for twenty-four hours and then sown broadcast. When the plants begin to grow it is customary in some localities to sprinkle them with a solution of lime to protect them against insects. A bamboo fence is sometimes built

around the bed to keep out carabaos and other animals. When the young seedlings are 25 to 30 centimeters high in the seed bed they are transplanted to the field which has been previously prepared. The young seedlings are usually topped and tied in bundles of 100 the day before they are to be planted in the fields. They are carried to the fields on carabao sleds where the transplanting is done by men, women and children, who receive from 12 to 20 centavos per day. Transplanting usually begins about the first of July and lasts until the middle of August. Harvesting begins during the latter part of October and ends in December or January, according to the season. At harvest time the palay is usually worth ₱1.80 per cavan, while at planting time it is worth ₱2 or more, according to the variety. There are five large rice mills in the province, two at San Isidro, one at Santa Rosa, and two at Cabanatuan.

Sugar cane.—Sugar cane is grown extensively in the southern part of the province. There are two varieties, the purple and the white; the bulk of the crop comes from the former variety. The cane is planted, as a general rule, on high level ground which is moist and well prepared. The planting is usually done during November, December, and January, the same months in which it is cut for grinding. The cane is allowed to grow twelve, thirteen, or fourteen months, according to the soil in which it is planted. On newly cleared land the period is eighteen months. The sugar is classified according to the way in which it is manufactured and prepared for market. The juice is generally extracted from the cane on the farms, and the crude sugar is shipped to Manila and China to be refined and granulated. On coming from the vats the sugar is put into a receptacle made of baked clay having the form of an inverted cone or a bell known as a *pilon* which serves as a package; the contents of one of these *pilon*es weighs about one quintal (100 to 112 pounds or about 50 kilograms).

Corn.—Corn is found growing all over the inhabited portions of the province. It is planted on soils not suited to the cultivation of rice, and on higher land which can not be irrigated. Where conditions permit, three crops are sometimes raised in one year. The bulk of the crop is harvested while the ears are in the roasting stage, the fodder being fed to carabaos and horses. Instead of the ears drying in the fields, the husks are pulled back over the ears, they are tied in bunches of 8 or 10, and are carried to the farmer's house where they are hung in the sun. With the exception of the roasting ears which are taken to market, very little corn is sold. The stalks are allowed to remain stand-

ing in the fields, after the tops and blades have been removed. All seed corn is pulled after the roasting-ear stage, dried, and in a great many cases is immediately planted.

Very little cultivation is given to growing corn, as it is generally planted as a catch crop. A great deal of corn is planted in May, in water furrows, and is harvested in July, when the transplanting of rice begins. Corn is not, as a rule, gathered at one time but is pulled as it is needed for food.

Tobacco.—Tobacco is grown extensively in the valley of the Pampanga River. This soil is a clay loam and is fertilized with sediment from the overflow of the river. The season for the planting of the seed beds is governed by the character of the soil to which the seedlings are to be transplanted. For high land, where there is no possibility of inundation, the seed beds are prepared in July and August and the transplanting takes place in September and October, while on low lands the seed is planted in October or November and transplanting takes place in December.

Careful growers prepare their seed beds in soil of the same character as that of the field where the tobacco is to be grown, in order that the roots may not suffer from being transplanted. These seed beds are usually made on level land, in plots from 12 to 15 meters square, or large enough for double the number of plants which are required. They are surrounded by a small ditch containing water for sprinkling. The earth from the ditch is placed in the middle of the inclosed section for the purpose of elevating it so that the water may drain off. The farmer works these beds carefully until the soil is pulverized, and sometimes fertilizes them with carabao manure. The large bed is then divided into beds 1 or 2 meters wide, separated from each other by small longitudinal ditches of shallow depth, in order to drain off the rain which might rot the seeds or injure the delicate roots of the plants. After thoroughly pulverizing all lumps on the bed, leveling the surface, and moistening the earth, the seeds are scattered on the soil. Before scattering, the seed is mixed with fine, dry sand, or ashes, in order that it may be properly distributed; it is then lightly pressed into the ground with the foot or a light roller. After the seeds have been sown, the farmer protects them against excessive heat and rain, by means of shelters or covers made of bamboo or banana leaves, with which the seed beds are covered from 10 o'clock a. m. until 4 p. m., on sunny days or when the rains are heavy and abundant. The worms are picked off every morning by the family of the farmer.

After forty-five or sometimes sixty days, when the plants have attained a height of 25 or 30 centimeters, they are transplanted from the seed beds. The method used for pulling the young plants is to moisten the soil, if the weather is dry, in order that the roots may easily free themselves. The most flourishing plants are selected; with a small stick in the right hand, which is inserted in the ground beside the plant to be pulled, the plant is raised toward the surface by a slight pressure of the hand on the upper end of the stick after which it is pulled out with the left hand, together with its vertical root and horizontal rootlets, without the slightest injury. This work is done during the cool hours of the day, between 4 and 9 in the morning and 5 and 7 in the afternoon.

Before transplanting, the grower plows longitudinal furrows about one meter apart in the prepared field. Behind the plow usually follows a member of the family who carries a basket with the young plants in it, and drops them into the furrow one by one, about one meter apart. This person is followed by another carrying a sharp stick, with which he makes holes and sets out the young plants. Care is taken that the central roots enter the holes without bending, to avoid injuring the plants. Care is also taken when watering the plants not to let the water fall on the leaves and break them down.

Miscellaneous crops.—Cacao is grown in different places in the southern part of the province, and coffee is grown near Pantabangan. These two crops would do much better if they received more attention. *Camotes* (sweet potatoes), lettuce, eggplants, and legumes are grown throughout the province. At Peñaranda, *icmo*, the leaf chewed with betel nut, is grown very extensively. It is grown in small plots about 15 meters square, over which are placed covers made of bamboo or banana leaves. Since it is the leaves of this plant that are valuable, the growers pay very close attention to the way they train the running vines.

IRRIGATION.

No large irrigation works are under construction at present, but the San Jose River as it emerges from the canyon about 5 kilometers above San Jose could be dammed so as to irrigate a large territory the year round. All streams flow southwest throughout the province and are diverted by numerous dams for local use, but no dams of permanent material exist. Cuyapo is probably the worst off in regard to water for irrigating purposes, as it is near no large stream. Except in years of drouth, Aliaga loses about 30 per cent of her rice crop by floods. This

place is lower than any other town in the province. The system of irrigation followed in the province is a coöperative one; that is, those farmers whose lands are contiguous and near the same stream, unite in building a dam across the main stream and in constructing mains and laterals to their respective farms. On the main ditch, all the farmers spend an equal amount of time and labor, which is usually done during the dry season or just before the seedbeds are prepared. The individual ditches are kept up by laborers of the interested farmers. The water is distributed among the farmers according to the size of their farms.

Some of these ditches are 15 to 25 kilometers in length; the one between San Jose and the barrio of Bakal toward Talavera being about 19 kilometers long. This irrigation ditch was first constructed in 1856 by Spaniards who, at that time, owned the lands through which it passed. Until 1896 there were three mains, each going in different directions and furnishing water to an area 30 kilometers square. In 1896, these ditches were practically abandoned, and no work was done on them until 1906, when a company of Spaniards and Filipinos bought the hacienda. This company and an American farmer living near Muñoz, opened one of the ditches; portions of another one which passes through the barrio of Muñoz are kept up by farmers who have lands between that place and the barrio of Palosapis, near San Juan de Guimba. This ditch is not as deep or as broad as it was when first constructed, though it carries a stream of water about 30 centimeters deep and 60 centimeters wide. In 1908 a company of Filipinos constructed a dam on a creek between Cuyapo and San Juan de Guimba, by means of which they intend to irrigate their lands. The proper expenditure of about ₱1,000 would make these old ditches carry four times as much water as they do to-day.

PUBLIC LANDS OPEN FOR HOMESTEADS.

Between Bongabon, Talavera, San Jose, and San Juan de Guimba is a broad stretch of public land, which is open to homesteaders; each man or head of a family may take up 16 hectares under the provisions of the homestead law. It is estimated that over 1,000 immigrants from the Provinces of Pangasinan, Ilocos Sur and Ilocos Norte have taken up land for homes near the road between the towns of San Juan de Guimba and San Jose. The population of the barrio of Nazaret north of Bongabon has been doubled by these immigrants settling on homesteads near that place.

As nearly all of this land is intersected by running water, the

farmers partially dam the streams, generally at an angle with the bank, until the water attains a level high enough to irrigate their land. From the main canal, laterals are made to the different homesteads. "Paaga" or early rice is planted on these new lands the first year. The soil is plowed and harrowed three times, the seed is sown broadcast and plowed in and the crop is harvested in from ninety to one hundred and twenty days. On fields that have water available for irrigation, the paddies are three or four times as large as the paddies in fields which depend on the rain for moisture. Of all the immigrants who have thus far taken up land in the province, the Ilocanos seem to be the best workers. This country, being well watered and well timbered, is an ideal location for home seekers.

CENTRAL LUZON AGRICULTURAL SCHOOL.

Situated at Muñoz, a barrio of San Juan de Guimba, on a Government reservation of 657 hectares of land, near the geographical center of the province, is the Central Luzon Agricultural School, which is under the supervision of Mr. A. A. Helm, of the Bureau of Education. This school is a valuable object lesson to the near-by farmers, some of whom visit it almost every day. These farmers, by watching the work that is being carried on at the school, get ideas which, when put into practice, on their own farms, will largely increase their profits.

MONTHLY VETERINARY REPORTS—JANUARY AND FEBRUARY.

RINDERPEST.

Pangasinan.—At the present time Pangasinan is suffering greater losses from rinderpest than any other province in the Islands. For the past six weeks there has been a gradual extension of the infected territory in this province, due to an insufficient quarantine guard. During the past month the number of infected municipalities has increased from six to eleven. During the past few weeks the number of new cases each week has averaged about fifty in the territory which has been inspected. The force of men, however, has been so small that it has been impossible to cover all of the infected territory each week; consequently a large number of cases are not included in the report. The latter part of January a request was made for 700 quarantine guards to be used in maintaining the quarantine over the localities infected with rinderpest. As a result of this request three companies of Philippine Scouts were detailed on this work. These will be distributed largely in the Province of Pangasinan, and the veterinary force in that province will be sufficiently increased to cover the infected territory. With this number of quarantine guards it will probably be possible to prevent further extension of the disease and gradually eliminate it from the municipalities already infected.

Tarlac.—In this province four municipalities are infected. The number of cases reported has been small and the disease has caused no serious losses recently. The force of employees in this province and the number of quarantine guards have been insufficient, but the disease has been kept fairly well under control.

Pampanga.—During the past month seven municipalities of this province have been infected. With a force consisting of 5 veterinarians, 15 American inspectors, and 28 Filipino inspectors, the infected territory has been thoroughly worked, and this will probably result in the number of infected municipalities being greatly reduced in the near future. In this province the

quarantine has been maintained by two Constabulary officers commanding 76 soldiers and 36 municipal police. While this number of quarantine guards has not supplied all the demands, it has been sufficiently large to cover the principal roads and trails leading from the infected territory.

Bulacan.—During the latter part of November, 1910, the number of infected municipalities of this province was reduced to one. On account of the large infected area in the Province of Pampanga only nine Constabulary soldiers were left as quarantine guards for the infected municipality of Bulacan. Recently rinderpest has appeared in three other municipalities of this province. The origin of this infection has not been determined, but it is quite possible that it was brought from formerly infected municipalities by animals being taken through quarantine lines.

Nueva Ecija.—During the past few weeks there have been three or four infected barrios in this province. One veterinarian has succeeded in keeping the disease under control.

Nueva Vizcaya.—For some time there has been one infected municipality in this province. Although it has not been possible to completely eradicate the disease, the quarantine has succeeded in keeping the clean territory from becoming infected.

Cagayan.—The Province of Cagayan contains two infected municipalities, but the losses have not been at all serious.

Isabela.—In this province the situation is practically the same as in the Province of Cagayan. It also contains two infected municipalities.

Oriental Negros.—Of all the southern provinces Oriental Negros has the largest infected area, having eight infected municipalities. During the past month 3 veterinarians and a large force of inspectors have been working on this outbreak. Although they have not succeeded in greatly reducing the extent of the infected territory they have kept the losses confined to a comparatively few cases. The work of eradication in this district has been greatly impeded by the lack of a sufficient number of quarantine guards. While 45 Constabulary soldiers have been on duty there for some time, the great extent of territory to be covered requires more than twice this number.

Cebu.—At the present time there is one infected municipality in this province. Rinderpest has existed in Cebu for several months, but recently it has been so well under control that the losses have been confined to five or six animals per month.

Leyte.—The situation in the Island of Leyte has greatly im-

proved during the past few weeks. At the present time only two municipalities are known to be infected, and the losses being sustained are comparatively small.

Bohol.—The infected territory in the municipality of Talibon which resulted from the bringing in of cattle from one of the adjoining infected islands, has recently been reduced to one barrio, which is now under a quarantine maintained by Constabulary soldiers.

Surigao.—There has been a great deal of difficulty in obtaining a sufficient number of quarantine guards for this province. For some time 10 Constabulary soldiers have been detailed on this work, but this number was entirely inadequate. Recently 15 special policemen were secured and this force of 25 quarantine guards has succeeded in covering a large part of the infected area. The disastrous results of not having a sufficient number of quarantine guards at the beginning of an outbreak are shown by the fact that rinderpest has made its appearance in the municipality of Gigaquit, several miles south of Surigao.

Moro.—Three months ago the losses in the Davao district from rinderpest far exceeded those of any other province in the Islands. Several large herds were almost completely wiped out, and the number of deaths averaged more than 100 per week. Upon the arrival of a representative from this Bureau very stringent measures were adopted to secure the eradication of rinderpest from this district and no quarantine or sanitary measures were overlooked. The provincial officials have been very enthusiastic in their efforts to eradicate this disease, and they have adopted and carried out practically all the recommendations made by this Bureau. Practically all animals found suffering with rinderpest, and a large number of the exposed have been slaughtered, and the Philippine Scouts have been used to maintain the necessary quarantine. The success attained in this district serves to illustrate what can be done in the line of disease eradication when all means and facilities are placed at the disposal of the men in charge of the outbreak. The situation now appears to be well in hand, and unless the infection has reached the mountain districts, where it is almost impossible to cope with this disease, the eradication of rinderpest from this province will probably be accomplished in the near future.

From the provinces which have not been mentioned there are no authentic reports of rinderpest. A few weeks ago the Provinces of Iloilo and Occidental Negros each contained one infected municipality. In these two provinces very stringent methods

were adopted, and all exposed animals were tied up for several days in order to prevent them from drinking in infected streams or pasturing on infected fields. Although these measures caused numerous complaints from the stock owners in these localities, they were continued for a length of time exceeding the period of the incubation of the disease with the result that the infection was eradicated from these provinces. They have now remained free from disease for several weeks, and the advisability of such measures seems sufficiently demonstrated.

MONTHLY CROP REPORTS—JANUARY.

ABACA.

Surigao.—Abacá throughout the entire province is in good condition. Some complaint is heard among the merchants that the farmers in certain sections of the province do not clean the fiber satisfactorily.

COCONUTS.

Oriental Negros.—Coconuts are one continuous crop which yields as good returns with as little attention as any crop that farmers can devote their attention to.

Surigao.—Coconuts throughout the province are in good condition.

COFFEE.

Mountain Province.—The coffee crop has been picked and sold, the average price being ₱16 per cavan. It is possible that in the future this section will be in a position to export large quantities of coffee, as it grows rapidly here and is of excellent quality.

CORN.

Bohol.—Some little damage was done to corn by windstorms during the month of December, but no serious losses were suffered. Corn is grown more extensively in the vicinity of Calape and Tubigon than in any other part of the island. In the vicinity of Loon and Maribojoc corn is a rather important crop and at the present time is in very good condition.

Cagayan.—Some corn has been planted during the month and it, in common with all the other growing crops, is badly in need of rain.

Cebu.—The corn crop has suffered greatly, especially on the west coast, because of the dry weather and in many cases will be almost a failure. The shortage in the last crop of corn is now beginning to be felt. The price has risen to ₱4 per cavan, the ordinary price being from ₱2.50 to ₱3. As a result of the high price corn is now being brought in from Negros and Bohol.

Iloilo.—In the southern part of the province about all that has been done during the month has been the planting and

cultivation of corn, which is the chief crop in that part of the province.

Oriental Negros.—A small amount of corn was harvested during January and some remains in the fields at the end of the month nearly ready to be picked.

Tarlac.—In some places in this province the ground is so dry that there will be a shortage of the corn crop.

COTTON.

Ilocos Norte.—Cotton is growing well and there is every promise of a good crop.

GARDEN VEGETABLES.

Antique.—An experimental garden has been started by the representative of the Bureau of Agriculture in the municipality of San Jose and so much interest has been taken in this work by the people that a number of other gardens have been planted. A prize of ₱20 has been offered for the best garden in this municipality.

Mountain Province.—The people in this province are gradually learning that different vegetables should be planted at different seasons and are also learning the methods by which each can be best cultivated. Until this information is very generally disseminated there will be no regular supply of vegetables.

GUINEA GRASS.

Mountain Province.—In January two different lots of Guinea grass roots were brought into this province from Baguio by the resident veterinarian of the Bureau of Agriculture. These roots were distributed in Suyoc, Cervantes, and Bontoc, and it remains to be seen what results will be obtained.

MISCELLANEOUS CROPS.

Bohol.—During the month there has been very little rainfall in the northern part of the Island and as a consequence the crops are suffering a little from drouth. Farming is not carried on very extensively in this part of the Island, not so much because of lack of work animals, but for the reason that the country around Getafe, Talibon, Ubay, and Sierra Bullones is very thinly populated and no great amount of rice, which is the only crop planted, except a small amount of corn, is needed to supply the needs of the people. In the vicinity of Calape and Tubigon crops are in a thriving condition, that being the richest part of the island. Two very enterprising farmers live in that district and attention is given to the raising of corn, sugar cane, and rice.

Cotabato.—Wax, biao, and copal are still being purchased in large quantities and shipped to Zamboanga and Singapore.

Tayabas.—Crops of all kinds have been good and the province is on the boom. Money is plentiful everywhere and prosperity is shown in the great number of new houses being erected in every municipality throughout the copra-producing section, and especially in Lucena.

MULBERRY.

Mountain Province.—Mulberry trees have been set out in Bontoc and are growing rapidly, while those in Cervantes, because of faulty planting, are rather backward.

RICE.

Antique.—It has been estimated that the municipality of Dao harvested about 70,000 cavans of palay from the last crop. This is nearly three times the crop of 1909, which means that the municipality has produced enough to supply its own needs and possibly have some surplus. Considering the shortage of Sibalom and San Jose crops this large harvest is very fortunate. Patnongan, San Jose, Sibalom, and San Remigio claim a joint shortage of about 86,000 cavans on this year's crop. The shortage in the northern municipalities of the province is proportionally greater.

Owing to the small amount of rice cultivated the past year the price of palay is now in some municipalities as high as ₱3 per cavan and is expected to go still higher. There is no municipality in the province where the price is lower than ₱2 per cavan. This is new palay and the old palay is much more expensive. The farmers of this province have been recommended to plant more corn and to plant it earlier as the amount of palay gathered this year will not be enough to supply the local demand.

Bohol.—There was sufficient rainfall during the month of December for the preparing of the fields and the planting of rice, and in most places the planting was completed during this month. On January 1 the young rice was in a thriving condition.

Bulacan.—There seems to be some divergence of opinion among the inhabitants of the province regarding the sufficiency of the rice crop. While some state that there was a fair average crop, others claim that there is a considerable shortage, due to drouth. This applies particularly to that portion bordering on the Candaba swamp and around San Miguel, which is considered the finest rice-growing section in the province.

Cagayan.—In the rice-growing section along the coast rain has been plentiful. Most of the early rice—i. e., that planted

on irrigated land—has been harvested. The harvesting of the late rice is just beginning.

Capiz.—In Capiz Province all of the rice in the Mambusao Valley and from Dao to Capiz has been harvested and was being thrashed during the month of January. In the municipality of Panitan there is one thrashing machine run by a small traction engine.

Cebu.—Rice is partly harvested, a portion of the crop having suffered because of lack of water. There has been very little rain and there has been a shortage of water in the irrigated districts.

Cotabato.—During the month of January 4,000 cavans of palay and 700 cavans of rice were shipped by Chinese merchants to Zamboanga and Jolo. The entire rice crop has not yet been harvested and the Moros report that it will be the largest crop ever grown in this district.

Ilocos Norte.—In San Nicolas 500 hectares more are planted to rice this year than last. The crop is of better quality than last year. In Solsona there is some excellent rice land which is easily irrigated. The crop early in December was just heading and promised a very good yield. In Dingras the rice crop is much earlier than in the neighboring municipality of Solsona. Considerably more than half of the crop had been harvested by December 1 and the remaining portion was being harvested as fast as possible.

Iloilo.—The rice crop has been practically all harvested and the yield is estimated to have been about one-third of an average crop for the entire province. Among the indications of prosperity in this province is the fact that a company having a capital of ₱100,000 is now building a rice mill in Pototan.

La Laguna.—There were two floods during the month and a little damage was done to the rice, nevertheless, the farmers report an abundant harvest.

Mountain Province.—Practically all Igorot rice land was being planted during the month of January. Rice land of Cervantes and Tagudin will be vacant until the beginning of the rainy season, thus giving those districts one instead of two crops a year.

Oriental Negros.—The rice crop throughout the area inspected is quite uniform and should be ready to harvest within a few weeks.

Rizal.—The rice crop will, as a whole, be better than last year. In some sections, however, it is poorer. Parañaque will have a poor crop. In Montalban and San Mateo the crop will

be about 25 per cent less than last year. Several barrios of Taguig, Pateros, Las Piñas, Pasay, and Caloocan have poor crops, while at Pamplona the rice is infested with a rust.

Surigao.—Rice will be hardly half a crop in the Surigao Valley, owing to rinderpest.

Tarlac.—The greater part of the rice crop had been harvested at the end of December. The yield for the whole province will be about one-fourth short of last year.

Zambales.—The present outlook for this year's rice crop is excellent. The province has lost something over 200 work animals by disease during the year. Nevertheless, the prospect is that a larger and better rice crop will be harvested this year than for the past two years. In the lowlands around San Narciso, San Antonio and San Marcelino the greatest yield will be had. The caingin rice is already being harvested as this is always the earliest crop. Farmers around Santa Fé state that rats are destroying considerable of their caingin rice.

RUBBER.

Cotabato.—The Para rubber planted by the Rio Grande Rubber Company on their estate at Reina Regente is doing well and has demonstrated that the soil and climatic conditions in the Cotabato Valley fulfill the necessary requirements for successful planting of this product.

Mountain Province.—Para rubber seeds have been planted in Bontoc and Cervantes.

SUGAR CANE.

Bohol.—The only part of this island in which sugar cane is grown to any extent is in the vicinity of Calape and Tubigon, where there are two small haciendas.

Bulacan.—Sugar cane, which is raised to some extent around Polo, Obando, Malolos, Quingua, and Calumpit promises an excellent yield this year.

Cebu.—Sugar cane has been mostly harvested and it is reported that there has been a good yield.

Ilocos Norte.—In San Nicolas the sugar-cane crop is larger and better than that of last year.

Iloilo.—Throughout the province wherever sugar cane is raised the farmers have been devoting all their time to the work of cutting and grinding, as well as the preparation of new land and the planting of it to sugar cane. In the northern part of the province along the Philippine Railway there is much new land being plowed and planted to cane. In the northern part of the municipality of Passi a Spanish company is preparing to

plant several hundred hectares of sugar cane, all this being new land that has probably never been planted to sugar cane before.

The difficulty experienced last year in planting sugar cane was lack of work animals and lack of cane for planting. This year the number of carabaos in the sugar districts has been almost doubled on account of importation from Cochin China and from other provinces, and also to some extent from natural increase. There is also an abundant supply of cane for planting and many of the smaller planters are not grinding their cane but are using it all to plant their own and their neighbor's haciendas. It is estimated that the amount of sugar cane planted this year will be more than double the amount planted last year.

A few new mills have been imported and a number of old mills have been repaired and placed in running order. It is said that a large number of new mills are to be put in the coming year in order to grind the cane now being planted. The best mill in the province has recently been installed by two progressive American hacenderos. They have a new five-roller mill which will extract 83 per cent of the sugar from the cane and which has a capacity of from 90 to 100 piculs of sugar per day. They have a considerable amount of cane to grind this year and are planting about five times as much for the coming year. They are also supplying all of their neighbors with seed and besides grinding their own cane will grind the cane of all the small haciendas in the immediate vicinity. This plantation is situated in a river valley three miles west of Dueñas, which contains some of the best sugar land in Panay and which will produce at least 100 piculs of sugar per hectare. This district formerly contained a number of haciendas, but the land has not been cultivated for some years. The present indications are that this section will soon be in a more prosperous condition than it ever has been before. The greatest difficulty with which these planters have to contend is the fact that there is no road whatever from their mill to the railroad station, three miles distant.

La Laguna.—The cane fields are in fine condition. The sugar planters complain of too much rain and have been unable to begin cutting on that account.

La Union.—All sugar-cane planters are busy making sugar and the crop is a good one although the price is considerably lower than last year.

Oriental Negros.—Sugar cane is now being harvested and the sugar cane fields are already being plowed and planted. The weather has been ideal for this work during the past month. The quarantine on account of rinderpest has caused some incon-

venience to the sugar planters in the infected districts but they have devised means of transportation without cattle and carabaos by using men, horses, cars, and boats to transport the cane and sugar. The work seems to go on about as rapidly, but probably costs a little more.

Rizal.—The sugar crop will be better than last year. There is also a larger acreage planted.

Tarlac.—The sugar crop throughout the province will be good. Sugar cane here is in excellent condition and the only danger is from cogon fires, against which there have been several alarms.

Zambales.—A small amount of sugar cane, which is rather inferior in quality, has been harvested.

TOBACCO.

Cebu.—The tobacco crop is short owing to the fact that large numbers of young plants have been washed away by the heavy rains of November and December.

Ilocos Norte.—The tobacco crop is growing well and looking very thrifty.

Iloilo.—Some tobacco is now being planted in the southern part of the province. In the rest of the province great activity is to be seen in planting tobacco. The area planted to tobacco this year will be greater than that of last year.

Isabela.—In the tobacco-growing section of the Cagayan Valley the month of January has been noted for the extremely dry weather and the work of planting tobacco has been considerably retarded, owing to the impossibility of getting the land in shape for transplanting. Many plants that have been transplanted have died for want of moisture and many others will soon die unless rain is forthcoming.

La Union.—Owing to the drought it is believed the tobacco crop this year will be very short. The showers that usually occur during January were lacking and tobacco is dying.

CURRENT NOTES.

THE PANGASINAN FAIR.

(January 29 to February 4.)

We are indebted to Mr. Sam H. Sherard, agricultural inspector, for the following account of the fair and carnival which was held in the town of Lingayen, Pangasinan, during the week ending February 4.

At the opening of the exposition Judge James C. Jenkins, of the Court of First Instance, in a very strong address emphasized to the people of Pangasinan that manual and intellectual labor are absolutely necessary for the complete development of genuine manhood and womanhood; that there is absolutely no excellence without great and unceasing labor.

The exhibit of the industrial and agricultural products of the province was preliminary to the preparation of the provincial exhibit at the Philippine Carnival which was held in Manila February 21 to 28. The place assigned to the exhibition was an inclosure adjoining the plaza of Lingayen which was filled with booths, the larger part of which was assigned to the exhibits of the different towns of the province, about thirty in all.

The best exhibits were those from the towns of Santa Barbara, Mangaldan, Calasiao, San Quintin, and Lingayen. The town of Santa Barbara exhibited 62 varieties of rice and some very fine specimens of lace work and embroidery. Ribbons indicating the first, second, and third prizes were awarded by a committee of judges.

The first prize for the best municipal exhibit was awarded to Santa Barbara. The exhibit of Mangaldan was quite remarkable for the specimens of coconuts raised in the town, some of which measured 88 centimeters in circumference.

The town of Calasiao amongst many other things included a fine collection of native hats. The importance of the hat industry of Calasiao is well known throughout the Philippine Islands. The towns of the eastern part of the province exhibited a great variety of leaf tobacco; some of the leaves measured 76.20 centimeters in length and 55.88 centimeters in



PLATE II COCONUT DRIER USED IN LA LAGUNA PROVINCE

breadth. Pangasinan is one of the first rice-growing provinces in the Philippines and the exhibits of rice, corn, coconuts, and tobacco as well as the exhibits of woodwork and other industries were a great credit to the energy and enterprise of the people and officials. While sugar cane is one of the leading products of the province, this industry received but little attention at the fair. There was also a small exhibit of live stock, such as native ponies, cattle, pigs, and poultry.

In addition to the agricultural and industrial exhibits a series of popular lectures were given by the representatives of the Bureau of Education, the Bureau of Health, and the Bureau of Agriculture. The first day was devoted to lectures on sanitation by the representatives of the Bureau of Health and the veterinarians of the Bureau of Agriculture. On the second day lectures on educational work were given by the division superintendent of schools and some of the leading teachers of the province. The third day was devoted to lectures by the provincial governor and other officials on provincial matters. The fourth day set apart for lectures on various phases of agricultural work and the leading crops of the province.

The evening of the last day was devoted to carnival features, the election of the carnival king, queen, and the various officers of their court. The fair which was pronounced a success by every one who visited it was largely the result of the work of the provincial governor, the provincial treasurer, the acting division superintendent of schools, and the third member of the provincial board in coöperation with the municipal officials and leading farmers of the province. It is planned to make the exposition a regular feature which will be held from year to year.

COCONUT CONDITIONS IN LAGUNA.

By O. W. BARRETT.

During the latter part of the past year the writer made a visit to the College of Agriculture at Los Baños where he inspected the various nurseries, fields, and plats under cultivation by the students of the college. From Los Baños a journey was made to Santa Cruz, the provincial capital, and from there to Majayjay, Lilio, and Pagsanjan.

Only at a point about midway between Santa Cruz and Magdalena were there noted any active cases of bud troubles in the coconuts; here three trees with dead leaves (one with live fruits) were found at a short distance from the highway; the trunks of the affected trees were severely attacked by a com-

paratively small boring beetle. There was no odor, and no insects were noticed about the top. Only one stump was noted near the trees and the leaves and buds of a felled tree had not been burned. I judge this disease can not be the genuine "bud rot" which caused so much loss to the planters a few years ago. Discussions with the president of Lilio and others led me to believe that "bud rot" always kills the trees quickly and never allows the retention of any fruits after the death of the leaves; however, a rare affection is known among the coconut planters, corresponding to the cases here mentioned, in which the fruits are retained, and from which the trees may recover.

About ten dead and leafless trunks were seen standing at the edge of a plantation some 4 to 6 kilometers below Majayjay; very possibly these had been killed by "bud rot," and the trunks had not been felled as they should have been.

Considering the very close planting—5 to 7 meters—the health of the trees was all that could be expected; the yield, however, is probably not more than one-third of the normal amount for mature trees when well spaced. In a very few cases was there noted any attempt at cultivation between the trees, and absolutely no cases of "clean cultivation" were seen. Near Santa Cruz, gabe, yams, and ginger were noted growing between rows of very old trees. A remarkably large percentage of mature trees were practically without fruits, due, doubtless, to the overclose planting and the utter lack of attention. If one-half the trees in some plantations were felled it is believed the yield of the area would be doubled.

According to the president of Lilio, the former planting distance was 10 varas (8.4 meters), but on account of the prevalent custom of selling coconut plantations at so much per tree, irrespective of quality, the present distance of 5 by 6 or at the most 6 by 7 meters has become very general.

Save at the Agricultural College at Los Baños very few coconuts were badly attacked by the oryctes ("uang") beetle. Practically no scale insects or fungus diseases were noted on the leaves anywhere.

Another great fault in the planting method of the Santa Cruz district is the setting out of young plants between the rows of the old or very unproductive trees: no case was noted of the felling of old trees in order to permit the growth of these young plants.

At Pagsanjan, the native oil mills and Señor Navarro's copra dryer were inspected. There is no question that some form of artificial dryer is very urgently needed in the Laguna coconut



PLATE III - NATIVE COCONUT-OIL MILL, USED IN LA LAGUNA PROVINCE

districts: first, because the smoke (creosote) permeating entire chunks of copra must render them unfit for higher uses such as making coconut butter, etc.; secondly, because the present method of drying over the husk and shell fire of the "tapahan" does not sufficiently reduce the moisture and in consequence several forms of mold are noticeable on the product when it is ready for bagging, and this undoubtedly results in the loss of a considerable amount of the oil from the copra while en route to Europe. The native oil press does not, of course, remove all of the oil, as would a modern hydraulic or even a metal screw press; however, the quality of "cake" should be very high for feeding purposes because of its freshness and high oil content. I would suggest that one of the Hamel Smith patent rotary machines, which are claimed to completely dry copra in from two to three hours without a trace of smoke in the finished product, be tried; one of these machines if set up either in Manila or Pagsanjan to demonstrate its usefulness to planters would, I believe, revolutionize the business in these Islands.

Considering the status of the coconut business in the Laguna districts, and comparing it with the same status in other countries in which I have had experience, I do not hesitate say that the coconut planters in the districts inspected on this trip are getting only about to 30 to 40 per cent of the proper income from their plantations. And since there appears to be very little or no loss from insects or fungus pests, and since the soil and the climate appear especially well suited for this culture I firmly believe that the said loss is due to the *faulty system of planting*, and to the *lack of cultivation and live legume mulching* in the plantations.

THE BACOLOD FAIR.

The Bacolod Fair opened on the morning of December 13. The Governor-General arrived at 5 in the afternoon, after which the parade took place; in the evening a reception was held for the Governor-General's party.

During the first day there was a convention of presidentes and a conference of planters. Both conferences discussed many matters affecting the welfare of the province. The principal subject of discussion by the planters was the question of importing foreign labor to cultivate the sugar plantations of Negros. Señor Esteban de la Rama made the principal address in favor of the proposition.

During the fair a number of speeches were delivered in the exposition building. Nearly all of the towns were represented

by agricultural and industrial exhibits, which were well displayed and a great credit to the exhibitors. One town, Kabankalan, attracted much attention on account of its rice exhibit; ninety-seven varieties all of which are grown in Kabankalan were on exhibit. Señor Juan Araneta had an exhibit from his own hacienda, which was separate from that sent in by his municipality. The athletic contests between the competing teams and members of the Visayan Athletic Association, which were held during the fair, were very good. After the regular events were over the Iloilo High School team played a game against a picked American team, which resulted in a score of 19 to 4 against the high school. The star feature of this game was a three-bagger by Governor-General Forbes, when the bases were full.

The closing function was a grand mask ball. Costumes of every variety and description were seen. The fair brought to Bacolod the largest crowds which have been seen for many years.

THE ILOILO FAIR.

(February 1 to 5.)

The fair opened Wednesday afternoon February 1 in the plaza at Jaro and was a revelation to its most ardent supporters. The principal towns in the province vied with their neighbors in exhibiting the best and largest variety of products, and the result was thousands of articles, the product of the farms and shops, live stock and other exhibits of interest gathered and arranged for inspection.

The agricultural display included samples of the best grades of sugar produced in the province, some of the largest and best stalks of sugar cane from Iloilo and Capiz Provinces, some of the finest hemp fiber grown in the Islands, samples of the different varieties of tobacco leaf grown in the province, many varieties of rice and fruits, for which prizes were awarded. The town of Sara sent an exhibit of eighty-five different kinds of rice raised within its borders. The Insular Lumber Company had an excellent display of hard woods and other forest products.

There was a live-stock section in which were exhibited horses, cows, carabaos, goats, sheep, and hogs, which represented the best stock raised in the province. There was also a small exhibition of fancy bred canines owned by Iloilo dog fanciers.

The industries and arts of the province were represented by the finest display ever seen in the Visayas containing thousands of patterns of sinamay, piña, jusi, and cotton cloth of many weaves and designs. There were many varieties of native

hats made in the towns of Pototan and Dumarao, and beautiful specimens of embroidery and lace work.

Beside agricultural and industrial exhibits there was an interesting exhibit of fisheries. This included not only live specimens in tanks but many varieties of dried fish, also fishing paraphernalia, such as traps, nets, seines, hooks, baskets, etc.

The leading commercial establishments of Iloilo arranged interesting and elaborate exhibits and the Philippine Railway Company had a most extensive display of the products from the territory along its line. Among the commercial exhibits those of the following firms were noted: Castle, Bros. Wolf & Sons, The Visayan Drug Company, Vargas Plow Factory, W. H. Lambert & Co., The Iloilo Electric Company, Mr. Rogers' roof paint, Hoskyn & Co., De la Rama's Sons, Villa de Panay, La Asamblea Cigar Factory of Molo, Parsons Hardware Company, and the Park Livery Stables.

The plaza of Jaro, large as it is, proved entirely too small. At last a way has been found to interest the people of the province and stimulate their pride in the quality of their work and products through comparison and rivalry with their neighbors. We learn that the fair was such a decided success financially beside having brought the various business interests of the section closer together, that it has been arranged to make it an annual affair, and February 1 to 5, 1912, has been set as the time for the next fair. Over 10,000 entrances were recorded for the five days of the exposition.

MORO PROVINCE AT ZAMBOANGA.

(February 7 to 14)

The fair opened on the morning of the 7th with a spectacular parade in which 10,000 men of many different tribes participated. At 10 o'clock the fair was formally opened with an inaugural address by Governor-General Forbes. Addresses were also made by General Pershing, governor of the Moro Province; the Hon. Sergio Osmeña, Speaker of the Philippine Assembly; Governor John P. Finley, of Zamboanga; the Sultan of Sulu, and Datus Mandi and Piang. These men spoke of the peace and harmony as well as the coöperation shown by the different tribes and people from the different islands and parts of the province. The whole exposition in fact spoke for peace and coöperation which means prosperity heretofore unknown in the history of this part of the Islands.

The fair grounds were just beyond the ice plant on the road to Calarian. Each district had a separate exhibit of its own,

the principal ones being those from Zamboanga, Lake Lanao, Cotabato, Davao, and Sulu. Each exhibit was arranged in the following groups: Agricultural, forestry, industrial, and fisheries. Beside the district exhibits there was a very interesting exhibit by the schools of the Moro Province which included many products of the industrial schools in Zamboanga.

The agricultural exhibits of the different districts consisted principally of samples of hemp, coconuts, copra, corn, cassava, rice, tobacco, sugar cane, coffee, cacao, a few samples of rubber, vegetables, and fruits. Castle, Bros.-Wolf & Sons had on exhibition various kinds of machinery for use on farms and plantations.

The live-stock exhibit consisted principally of horses, cattle, carabaos, goats, sheep, swine, and poultry. A Morgan stallion, Indian cattle, guinea pigs, and rabbits were exhibited by the Bureau of Agriculture.

The industrial exhibits consisted principally of furniture, native cloth, needlework, hats, clothing, and native weapons, etc.

The forestry and botany exhibits furnished by the large mill owners of Mindanao and of the bureaus of Forestry and Science from Manila were very interesting. There were specimens of a large variety of the best forest trees grown in Mindanao and in fact in the Philippines. This exhibit was one of the most attractive on the fair grounds.

The fishery exhibit which was principally from the districts of Jolo and Zamboanga was of more than ordinary interest in that it contained specimens of pearl shells, pearls, and pearl-fishing outfits representing an industry which is found only in the Moro Province. Mr. Frank L. Strong, of Manila, had on exhibition some samples of diving suits similar to those used by the pearl divers of Jolo.

Wednesday, February 8, was Cotabato day. The principal feature of the day was a military review by Maj. Gen. J. Franklin Bell, commanding the Philippines Division.

Thursday, February 9, was naval and aquatic day. In these events many vintas and other Moro craft gaily decorated and flying the banners of their respective chiefs took part. There were swimming races and boat races between the crews from the U. S. steamers *New York*, *New Orleans*, and *Albany*.

Friday, February 10, was Sulu day. The principal feature of the program was the parade by the different tribes from the Sulu district in which the Sultan in his royal native costume was a very conspicuous figure.

Saturday, February 11, was Davao day. The events of the

day were in the hands of the chiefs and officials of the Davao district. A striking feature of the Davao parade was an elephant carrying a very attractive exhibit of Davao hemp which was prepared by the planters of that district. Davao is famous for the superior hemp fiber which it produces. Another feature of the day's program was the hemp-stripping contest between the McLane and Crumb hemp machines. The hemp used for this test was of the Maguindanao variety from the San Ramon farm. The horse and cattle shows took place in the afternoon.

Sunday, February 12, was flower day. The feature of this day's program was the flower parade which consisted of automobiles, carriages, floats, etc., decorated with flowers, and men, women, and children carrying flowers.

Monday, February 13, was Zamboanga day. The officials of the Zamboanga district were in charge of the program for the day. Altogether the people of the Moro capital and Zamboanga district made this day one of the most enthusiastic of the fair.

Tuesday, February 14, was Lanao day and the last day of the fair. In the evening a grand parade and torchlight procession constituted the closing function.

The annual field tournament of the Department of Mindanao which included sham battles, cavalry rough riding, packers' contests, baseball games, etc., was one of the most interesting features of the fair. Daily concerts were furnished by the four military bands and the Philippines Constabulary Band from Manila. Immense crowds of people from all parts of the Moro Province, from Manila and many of the provinces thronged the grounds each day. Civil and military officials, merchants and planters shared in the success of the Zamboanga Fair which has gone into history as a landmark in the progress of the Moro Province.

SCHOOL GARDENS IN THE PROVINCE OF ANTIQUE.

The Antique School Bulletin for January 25, 1911, contains the following note regarding school garden work in that province:

The interest of the teachers is being aroused this year as never before. At the beginning of the school year, the supervisor offered a prize of ₱10 for the best and ₱5 for the second best garden in the district. Many schools entered enthusiastically, and the results of their labor are certainly encouraging. At San Pedro an early garden was planted to native and American vegetables. The plants were thriving exceedingly well until the storm of November 1st came and swept them away. The American variety of corn was just in full silk and gave promise of a splendid yield, and the American variety of okra was bearing nicely. The gardens at Guintas,

Badiañgan, Pantao, and Buhang were likewise destroyed by the storm after giving promise of being a great success. However, at Guintas another has been started and gives promise of good results.

At San Jose Central, owing to the fact that the ground had to be cleared of trees, stumps and other rubbish, the pupils were late in planting. However we have a nice young garden and shall have an opportunity to see which is more successful, the garden with or without irrigation.

Too much can not be said of the success of the Antique teacher in his school gardening. Everything that was planted thrived wonderfully and one encouraging result is that the interest of the people is aroused and they are daily inquiring for seeds.

The following varieties of plants are growing to perfection: Pechay, mustard, lettuce, pepper, turnip, radishes, cabbage, tomatoes, carrots, green curled lettuce, and beets.

The teachers and pupils are keeping a record of each planting, and we hope in another year to have some reliable data to work from. Gardening in Antique Province is no longer an experiment. We know that it can be made a success.

NOTES FROM OTHER FIELDS.

ORANGE TREE CULTURE.

According to Mr. T. R. Wallace, pruning is a phase of orange-tree culture which receives but little attention, and he considers it one of the important details. In the Porto Rico Horticultural News for October (Vol. III, No. 10) he gives an account of his experiments and observations, stating that if an orange orchard is on healthy root, in suitable soil and climate, and the trees kept healthy by proper fertilization, the value of the crops can be greatly enhanced by pruning. Mr. Wallace goes on to say that the principle object of his experiments was to find what methods of culture must go hand in hand with the use of fertilizer to obtain the most desirable results, in quantity and quality of the fruit. In the attempt to produce quantity by direct fertilizing, an abundance of fruit wood was grown which died instead of producing fruit and the deadwood was invariably found inside the tree. Concerning the cause and best remedy for this, we quote the following from Mr. Wallace's article:

The inclination of the citrus trees after a few years is to grow top, and the top usually forms like a pyramid over the center of the tree, shutting out the light and air from the center or inside of the tree. This deprives the tree of considerable bearing surface inside and the crop is borne mostly on the outside. As this becomes habitual, even though we fertilize ever so cleverly to produce fruit wood, the interior fruit wood dies from simple inanition, and practically the bearing of inside fruit stops. This can not be corrected by simply cleaning out the interior of the tree nor by thinning out fruit wood from the side. The letting in of light and air through the sides of the tree is of no important value, and indeed the denser the foliage of the sides the better protection the outside fruit will have from winds and severe climatic changes.

Practically the pruning of the orange tree consists in removing the branch reaching up and inclosing the center-top and the opening out of the center so that the air and light can freely descend upon and into the cup-top thus produced. This permits the tree to prepare and nourish an inside rim or surface of fruiting wood, and to bear fruit on it. Practically that provides two fruiting surfaces, an outside and inside. The taking out of the top allows more strength to concentrate in the lower sides and they become rich and strong to the ground, so that they not only produce more fruit, but afford their crop more protection by dense side foliage. Thus an increase in both quantity and quality of fruit is effected. But this is still

further augmented by the crop grown inside. This inside crop is as well very superior fruit for packing, as it is protected from the wind, and as well there is always a sufficient thin foliage swinging over the inside rim of the cup to protect from sun-burn.

In such pruning only the saw is required, and care must be exercised to cut all limbs fully back to the eye, and no limb should be nipped or cut on any part of its length or between buds, as in such case it will either die back or sprout like a broom. This method of pruning is not expensive, and can be done very quickly by anyone who can handle a saw properly. It can not be done periodically every few years, but each year the trees should be gone over. The first year it will be found that but one, two or three limbs can be profitably and safely removed.

The next year another limb or two can be removed, until the proper inside shape and healthy fruiting wood is produced. The increase both in quantity and quality of the crop will more than effect the seeming loss of crop suggested by removing the central limbs reaching up into the top.

COPRA DRYING.

In *Tropical Agriculturist* for November, 1910 (Vol. XXXV, No. 5), Mr. J. C. Willis gives an abstract of an article on the drying of copra published in *Der Tropenpflanzer*. It is stated that a mold and darker coloration are caused from the fact that the kernel of the freshly opened nut is wet with coconut milk. Consequently, the first stage of drying requires a fairly high temperature, about 60° to 70° C. or higher. After the outer moisture has disappeared and the flesh is a little dried the temperature may be lowered to 50° and maintained at this until the copra is at least half dry. Then the temperature must be raised again to remove the last moisture and the copra must be cooled in an airy room. Artificial heat is preferable to sun heat and leads to a desirable uniformity in the sample.

Copra drying should be undertaken immediately after the opening of the nuts and should be finished in 24 hours.

Results of experiments in New Guinea show that 4,438 nuts gave a ton of copra, and freshly cut kernels gave 62.7 per cent of dry copra.

MAIZE AS A CATCH CROP.

It is suggested in *Tropical Life* (Vol. VI, No. 11) that the cultivation of maize on rubber estates might be profitable either as a means of preparing the land for planting rubber trees, or as a catch crop between the trees after planting.

In *lalang* ground maize would be especially suitable as a first crop and only one plowing would be necessary providing it was thoroughly done. While the maize is growing the grass and weeds are decomposing, and after harvesting the crop, the ground is easier to clear. Then too, the maize crop should pay

the expenses of preparing the ground for planting the rubber trees.

Where the plantations have already been started, maize could be grown between the rows of rubber trees and serve as a means of keeping the ground clear of weeds as well as paying part of the expenses of cultivation.

THE DEVELOPMENT OF THE SUGAR INDUSTRY IN HAWAII.

The Bureau of the Census, of the Department of Commerce and Labor, has compiled some interesting data with regard to the manufactures in Hawaii for 1909. The statistics show a large variety of fairly well established industries, but of these the manufacture of sugar is the most important, representing 76 per cent of the total value of products in 1909 and 82 per cent in 1899. It is stated that the decreasing proportion for sugar in 1909 indicates a larger growth in the general manufactures of the Islands.

The number of establishments in 1909 was 46, as compared with 44 in 1899, an increase of 5 per cent. The capitalization increased from ₧15,984,000 in 1899 to ₧29,668,000 in 1909, or 86 per cent. The gross value of products increased from ₧38,510,000 to ₧71,900,000, or 87 per cent. The amount added by manufacturing processes increased from ₧18,954,000 to ₧34,816,000, or 84 per cent.

The following table is a comparative summary of the sugar industry:

Details.	Sugar		Per cent of increase, 1899 to 1909.
	1909	1899	
Number of establishments	46	44	5
Capital	₧29,668,000	₧15,984,000	86
Cost of materials used	₧37,084,000	₧19,556,000	90
Salaries and wages	₧2,094,000	₧2,224,000	* 6
Miscellaneous expenses	₧4,906,000	₧1,242,000	295
Value of products	₧71,900,000	₧38,510,000	87
Value added by manufacture (products less cost of materials)	₧34,816,000	₧18,954,000	
Employees, number salaried officials and clerks	179	385	* 54
Average number of wage earners employed during the year	2,517	2,369	6

* Decrease.

MARKET REPORTS.

NOTES ON MANILA MARKETS FOR JANUARY.

By K&N & Co.

(Based on advices from London, December 29; New York, December 30; San Francisco, January 8; Hongkong, January 28; Cebu, January 28; Iloilo, January 28.)

SUGAR.

Iloilo.—Freer arrivals and business done in No. 3 for China per picul at first cost; Nos. 1 and 2 have been sold at ₱6.25 and ₱5.90, respectively.

Manila.—Sales made at ₱5.40 per picul, first cost, unclassified, for shipment to China; for other markets ₱5.50 No. 1, ₱5 No. 2, and ₱4.50 No. 3 talked.

Cebu.—No quotation.

HEMP.

Market very dull on account of depressing advices from United Kingdom and United States; we quote fair current for Europe ₱7.25 and for America ₱7.75 per picul, f. o. b. Good current might be bought at ₱15.50 per picul, f. o. b. Receipts at all ports for January are 110,303 bales against 98,811 bales 1910 and 107,343 bales 1909 for the same month.

COPRA.

Weaker and quoted ₱12.03 per picul Manila fair merchantable and ₱13.40 Cebu fair merchantable sun dried, f. o. b.

DISTRIBUTION OF PRINCIPAL PHILIPPINE EXPORTS FOR JANUARY, 1911.

Products exported.	United States.	China.	Pacific Coast.	Great Britain.	Continent of Europe.	Australia.	Japan.	Malay States and India.
Dry sugar (tons)		810						
Hemp (bales)	43,620	600		32,075	5,882	1,204	1,667	700
Copra (piculs)			14,400	2,400	74,976			
Cigars (thousands)	385	2,265	566	960	540	105	127	1,156

MANILA AND LONDON FIBER MARKET.

MANILA HEMP.

Arrivals at Manila during January, 1911.

Province.	Piculs.	Bales.
Albay	45,866	22,983
Sorsogon	12,600	6,300
Camarines	20,972	10,486
Leyte	21,856	10,928
Samar	15,812	7,906
Mindanao	12,144	6,072
Other Districts	22,858	11,429
Cebu	9,478	4,789
Total	161,586	80,793

Receipts and shipments.

(Telegram from Manila to London, February 6, 1911.)

	1911	1910
	<i>Bales</i>	<i>Bales</i>
Hemp receipts at Manila since January 1	98,340	91,612
Hemp receipts at Cebu, etc., since January 1	37,866	27,405
Hemp receipts at all ports since January 1	136,206	119,017
Shipments to United Kingdom by steamer, cleared since January 1	45,217	22,917
Shipments to Atlantic coast, United States, by steamer, cleared since January 1	56,656	68,536
Shipments to Pacific coast, United States, by steamer, cleared since January 1	10,178	14,987
Shipments to continental ports, by steamer, cleared since January 1	9,082	2,732
Shipments to all other ports	4,771	
Local consumption since January 1	1,000	
Loading steamer on the berth for the United Kingdom about	5,771	5,475
Loading steamer on the berth for Atlantic coast, United States, about	12,000	18,000
		11,000

Bales of hemp loading for United Kingdom, by steamer Kioto (Cebu)..... 12,000

LONDON QUOTATIONS.

The following quotations on Manila hemp, sisal, and maguey are taken from the Weekly Market Report of Messrs. Landauer & Co., dated London, December 21, 1910, and Messrs. Sloan & Mitchell, of Manila:

Manila hemp.

	Spot and close by (per picul).
Best marks	26.25-27.50
Good marks	25.00-25.65
Good current	21.88-22.50
25 per cent over current	14.00-14.40
Fair current	12.15-12.50
Superior seconds	12.00-12.10
Good seconds	11.85-12.10
Fair seconds	11.44-11.55
Good brown	11.30-11.44
Fair brown	11.25-11.30
Manila hemp strings	8.75-9.85

SISAL HEMP.

No new feature of interest. The quotation in New York is 4 cents, equal to £20 (₱11 per picul) c. i. f. Europe.

MANILA MAGUEY.

More interest has been evidenced in this article, and business for forward shipment has been concluded at ₱10.75 to ₱11 per picul No. 1, ₱9.85 to ₱10 per picul No. 2, and ₱8.90 to ₱9.05 per picul for No. 3. No. 1 maguey was quoted at ₱7 a picul in Manila on December 21.

MANILA QUOTATIONS.

The following are the Manila quotations for abacá, dated December 21, 1910:

Good current	₱16.00
50 per cent over current	13.20
25 per cent over current	9.20
United States current—dull	8.00
United Kingdom current—dull	7.40
Superior seconds—dull	7.20
Good seconds	7.00
Good reds	6.60

ILOILO SUGAR MARKET FOR NOVEMBER, DECEMBER, AND JANUARY.

By FIGUERAS HERMANOS.

Arrivals of the new crop from the sugar mills during November amounted to 15,685 piculs, for December 62,536 piculs, and for January 218,365 piculs. The price during these months was only nominal. For November there was a gradual decline from 5 pesos and 6 reales¹ on the first of the month to 5 pesos and 1 real at the close of the month; during December there was but a slight increase from 5 pesos and 1 real to 5 pesos and 3 reales; during January the price varied but little, the highest quotation for the month being 5 pesos 4½ reales.

¹ 1 real equals 12½ centavos.

November, December, and January shipments.

[In piculs.]

Date.	Vessel.	Destination.	Superior.	Wet.
1910.				
Nov. 8	Sungkiang	Hongkong via Cebu	2,554	
Nov. 18	Tringganu	Cebu (Marseilles, Antwerp)	3,200	
Nov. 20	Dacre Castle	New York	38,600	
Nov. 23	Kweilin	Ningpo, Shanghai, and Chingkiang	29,847	
Nov. 25	Sungkiang	Hongkong	2,737	
Nov. 30	Kaifong	do	886	
	Total for November		72,824	
Dec. 9	Rubi	Cebu	1,154	
Dec. 9	Sungkiang	do	248	
Dec. 15	Kaifong	Hongkong	3,230	
Dec. 18	Zafiro	Manila	2,191	
Dec. 28	Sungkiang	Hongkong	7,195	
Dec. 30	Rubi	do	8,009	
	Total for December		17,067	
1911.				
Jan. 1	Kaifong	Cebu	1,697	
Jan. 8	Zafiro	Manila	9,221	
Jan. 12	Sungkiang	Cebu	1,016	
Jan. 18	Kaifong	Hongkong via Cebu	6,996	29.88
Jan. 22	Rubi	Hongkong via Manila	6,819	
Jan. 29	Zafiro	Manila	6,426	
	Total for January		82,175	29.88

Exports up to February 5, 1911.

[In piculs.]

To—	1909-10 crop.		1910-11 crop.	
	Superior.	Wet.	Superior.	Wet.
United States	18,400		33,600	
China	29,722		98,697	29.88
Total	48,122		132,297	29.88

MANILA RICE MARKET.

The following quotations are taken from the Market Report of Messrs. Sloan & Mitchell, dated Manila, February 9, 1911:

Saigon No. 2 blanco, 125 pounds ^a —firm	₱5.65
Rangoon, per cavan ^b	5.25
Pangasinan milled, per cavan—quiet	5.80
Second white, per cavan—quiet	5.65

^a 56.6 kilos.

^b 1 cavan equals 75 liters.

PRINCIPAL PHILIPPINE IMPORTS AND EXPORTS DECEMBER, 1910, AND JANUARY, 1911.

By the INSULAR COLLECTOR OF CUSTOMS.

DECEMBER, 1910.

IMPORTS.

Articles	Units.	Manila.	Cebu.	Iloilo.	Jolo.	Zamboanga.	Balabac.	Total.
Rice	Quantity -- Value --	18,047,948 614,850	5,578,702 208,405	2,247,761 71,304	75,730 2,972	210,886 7,904	1,069 51	26,161,998 900,498
Beef cattle	Quantity -- Value --	2,159 248,560	1,466 7,456	1,953 15,938	14 7,503	14 10,697	1 313	4,126 287,807
Sugar	Quantity -- Value --	15,292 18,084	382 1,483	1,085 1,146	560 560	644 2,162	26	20,885 20,885
Coffee	Quantity -- Value --	5,566 54,669	372 8,629	436 110	160	2,632	7,186	7,186 63,408
Cacao	Quantity -- Value --	14,053 305,447	2,638	92	389	339	16,783	306,175
Eggs	Quantity -- Value --	25,146	44	23	25,213			25,213
Raw cotton	Quantity -- Value --							

EXPORTS.

Hemp	Quantity -- Value --	12,374,779 1,159,866	2,057,066 215,075	8,253	14,440,118 1,375,596
Copra	Quantity -- Value --	10,514,218 879,654	2,728,988 260,050	109,505 9,807	13,548,192 1,165,381
Sugar	Quantity -- Value --	12,667 414	912,564 41,209	16,285	1,925,281 41,623
Cigars	Quantity -- Value --	13,012 135,802	13,012 135,802	13,012	13,012
Cigarettes	Quantity -- Value --	2,390 2,005	2,390 2,005	2,390	2,390
Tobacco	Quantity -- Value --	1,294,346 226,819	1,294,346 226,819	1,294,346	1,294,346

JANUARY, 1911.

IMPORTS

Articles.	Units.	Manila.	Cebu.	Itollo.	Total.
Rice	Quantity ----- Kilos ----- Value ----- Dollars -----	5,002,148 169,814	824,397 24,827	1,341,014 42,407	7,167,549 237,048
Beef cattle	Quantity ----- Number ----- Value ----- Dollars -----	2,870 51,812	200 6,500	140 2,671	3,210 60,983
Eggs	Quantity ----- Dozens ----- Value ----- Dollars -----	390,520 31,328	54 5	242 27	390,816 31,890
Sugar	Quantity ----- Kilos ----- Value ----- Dollars -----	243,499 24,354	22,698 1,827	27,250 1,869	293,437 28,060
Coffee	Quantity ----- Kilos ----- Value ----- Dollars -----	122,960 33,358	2,155 54	54 18	125,169 33,960
Cacao	Quantity ----- Kilos ----- Value ----- Dollars -----	138,155 39,142	20,431 5,950	22 7	158,608 45,099
Raw cotton	Quantity ----- Kilos ----- Value ----- Dollars -----	23,352 7,309			23,352 7,309

EXPORTS.

	Quantity	Kilos
Hemp	Value	3,092,770
	Value	11,076,577
	Value	1,049,198
Copra	Quantity	930,061
	Value	1,389,359
	Value	2,274,410
	Value	98,750
	Value	9,572,684
Sugar	Quantity	84,280
	Value	3,599,800
	Value	2,379,896
	Value	151,042
Cigars	Quantity	101,974
	Value	7,200
	Value	88,975
	Value	2,978
Cigarettes	Quantity	3,466
	Value	1,042,227
Tobacco	Quantity	1,042,227
	Value	162,477

TEMPERATURE AND RAINFALL FOR AGRICULTURAL DISTRICTS IN THE PHILIPPINES.

By the DIRECTOR OF THE WEATHER BUREAU.

JANUARY, 1911.

[Temperature and total rainfall for twenty-four hours beginning at 6 a. m. each day.]

Date	Hemp.				Sugar, Iloilo.		Rice, Tarlac.		Tobacco.			
	Albay.		Tacloban.		Temperature.	Rainfall.	Temperature.	Rainfall.	Aparri.		San Fernando.	
	Temperature.	Rainfall.	Temperature.	Rainfall.					Temperature.	Rainfall.	Temperature.	Rainfall.
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
1	24.6	3.6	25.6	6.9	25.2	0.8	25.2		23.7		25	0.8
2	25.6		25.4		25.1		26		22	17.7	25.2	
3	25.8	30.2	25	.5	24.6		25.2		22.5	12.2	24.6	
4	24.6	22.5	26.1	1	25.6	.5	26		23.6	1.5	24.6	
5	25.5	3.8	26.6		26.5		27.7		24.6	4.3	25	
6	26.4	2.1	26	19	26.4		28.7		23.7	.8	26.2	
7	26.2	8.9	25.6	31.1	26.1	6.1	24.8		23.1	.8	25.2	
8	25.6	35.6	25.2	5.1	24.7	.8	25.2		23.8		24.1	
9	25.3	12.5	26.6		26.6		25.9		23.4		23.9	
10	25.1		26.5		26.9		27		23.6	10.7	25.6	
11	25.2		26.5		26.1		28.5		22.8	67.4	25.4	
12	24.7		26.5		25.8		27.3		21.7	19.4	24.8	
13	24.5	11.7	25.6	5.6	26.3		26.7		20.9	8.9	25	
14	26.4		26.6		26.9		27.4		22.9	4.6	25	
15	25.8		26.8		27		27		21.8	21.8	25.9	
16	26.2		26.6		26.8		(*)		21.3	89.6	25.8	
17	26.8		27.1		26.8				21.6	2.6	25	
18	26.2	4.6	25.3	2.8	26.6				22.9	17.9	21.2	
19	25.7	.8	26.9		26.2				22.4	11.7	24.2	
20	26.4		26.3	4.9	26				22	21.8	24.6	
21	26.2	23.8	26.4	1.5	26.3				23		24.8	
22	25.4	1	26.4		26.4	.5			23.4	25.6	26.4	
23	24.8		25.9	.8	26.2				22.4	15.5	25.2	
24	24.8		26.9	1.3	26				23		24.7	
25	25.5		26.2	1	26.1				22.1		24.8	
26	26.2	1.5	27.1		27				23.8		25.6	
27	25.7		27.2		26.8	.8			24.2		25.5	
28	26.2		26.8	3.8	26.8				24.6		24.4	
29	26.8	6.1	26.6		26.9				24.8		25.6	
30	25.9	.8	26.6		26.6				24.8		25.4	
31	26.7		27.5		27				25.3		27	

*The fire on January 29 destroyed part of the instruments and all the records of this station.

CROPS PLANTED AND HARVESTED AND CONDITION OF SAME TAKEN FROM QUARTERLY CROP REPORTS FOR THE QUARTER ENDING SEPTEMBER 30, 1910.

[NOTE.—Attention is invited to the fact that rice should be understood as being in the unhulled state. 75 liters=1 cavan; 63.25 kilos=1 picul; 46 kilos=1 quintal; 11.5 kilos=1 arroba; 0.4047 hectare=1 acre.]

Province and crop.	Condition.	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
		Hectares.	Hectares.		
Agusan:					
Rice	Fair	61	373	264,900	Liters.
Abaca	Good	—	123	64,072	Kilos.
Corn	do	58	19	14,775	Liters.
Albay:					
Rice	do	6,211	85	56,400	Do.
Abaca	do	346	14,491	3,197,224	Kilos.
Copra	do	—	—	209,377	Do.
Sugar cane	do	53	99	48,702	Do.
Corn	Fair	71	361	196,500	Liters.
Ambos Camarines.					
Rice	Good	8,153	72	21,600	Do.
Abaca	do	185	10,280	1,747,155	Kilos.
Copra	do	—	—	210,053	Do.
Sugar cane	do	49	90	44,971	Do.
Corn	do	16	262	175,750	Liters.
Antique:					
Rice	Fair	11,949	763	700,725	Do.
Abaca	Good	24	69	17,900	Kilos.
Copra	do	—	—	6,198	Do.
Corn	do	—	334	132,600	Liters.
Coffee	do	16	1	57	Kilos.
Bataan:					
Rice	Fair	5,536	—	—	—
Corn	do	108	125	80,775	Liters.
Batangas:					
Rice	do	783	8,896	4,763,025	Do.
Abaca	Good	7	311	51,800	Kilos.
Copra	Fair	—	—	6,325	Do.
Corn	do	25	4,903	2,696,175	Liters.
Coffee	do	29	—	—	—
Bohol:					
Rice	do	12,133	420	550,500	Do.
Abaca	do	18	806	267,358	Kilos.
Copra	Good	—	—	757,355	Do.
Sugar cane	do	39	139	124,160	Do.
Corn	Fair	2,380	5,619	5,207,875	Liters.
Bulacan:					
Rice	do	35,665	933	143,100	Do.
Sugar cane	Good	—	77	106,197	Kilos.
Corn	Fair	10	2,430	1,567,500	Liters.
Coffee	do	—	—	—	—
Cacao	do	—	—	—	—
Cagayan:					
Rice	do	3,607	1,089	800,100	Do.
Sugar cane	do	17	10	3,668	Kilos.
Corn	do	705	5,679	5,712,105	Liters.
Tobacco	do	79	—	—	—
Capiz:					
Rice	do	26,400	8,618	11,832,975	Do.
Abaca	do	58	467	160,275	Kilos.
Copra	do	—	—	403,598	Do.
Sugar cane	do	62	35	14,990	Do.
Corn	do	155	1,176	763,250	Liters.
Cavite:					
Rice	do	10,451	3,563	2,489,250	Do.
Abaca	Good	160	800	818,970	Kilos.
Copra	do	—	—	20,872	Do.
Sugar cane	do	63	—	—	—
Corn	Fair	27	911	715,125	Liters.

Crops planted and harvested, etc.—Continued.

Province and crop.	Condition.	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
Cebu:		<i>Hectares.</i>	<i>Hectares.</i>		
Rice	Fair	1,421	961	1,108,875	Liters.
Abaca	Good	1,301	2,374	515,551	Kilos.
Copra	do			748,627	Do.
Corn	Fair	15,982	33,640	24,967,050	Liters.
Maguay	Good	157	563	111,636	Kilos.
Tobacco	Fair		374	899,740	Do.
Ilocos Norte:					
Rice	do	60,378	62	175,500	Liters.
Corn	do		985	764,325	Do.
Tobacco	do		294	249,918	Kilos.
Coffee	do	81	7	1,679	Do.
Cacao	do	100	18	1,587	Do.
Ilocos Sur.					
Rice	do	38,461	28	12,450	Liters.
Sugar	Good				
Corn	Fair	40	1,766	901,200	Liters.
Maguay	Good	11	12	10,589	Kilos.
Cacao	Fair	10	2	69	Do.
Iloilo:					
Rice	do	38,471	983	713,625	Liters.
Abaca	Good	15	438	79,442	Kilos.
Copra	do			49,145	Do.
Sugar cane	do	52			
Corn	Fair	474	4,799	2,766,225	Liters.
Isabela.					
Rice	do	25	12	900	Do.
Corn	do	4,734	11,110	14,210,100	Do.
La Laguna:					
Rice	do	5,188	1,089	2,146,650	Do.
Abaca	Good	7	313	170,838	Kilos.
Copra	do			1,276,764	Do.
Sugar cane	do	7	11	7,590	Do.
Corn	Fair	85	235	350,700	Liters.
La Union.					
Rice	do	31,434			
Copra	do			45,097	Kilos.
Sugar cane	do	123			
Corn	do	20	818	456,900	Liters.
Coffee	do	8			
Leyte					
Rice	Good	8,250	2,374	2,878,650	Liters.
Abaca	Fair	3,114	10,493	5,466,255	Kilos.
Copra	Good			1,028,445	Do.
Sugar cane	Fair	106	250	848,507	Do.
Corn	do	1,861	3,784	2,722,650	Liters.
Tobacco	Good	286	1,446	379,960	Kilos.
Mindoro:					
Rice	Fair	2,413	451	289,775	Liters.
Abaca	Good	24	554	142,818	Kilos.
Copra	do			6,461	Do.
Sugar cane	Fair		11	5,756	Do.
Corn	do	2	279	184,200	Liters.
Misamis					
Rice	do	662	660	418,500	Do.
Abaca	do	45	2,197	342,815	Kilos.
Copra	Good			160,212	Do.
Sugar cane	do	10	16	7,969	Do.
Corn	Fair	235	1,581	1,652,850	Liters.
Moro:					
Rice	do	1,996	431	204,225	Do.
Abaca	Good	441	2,894	1,674,797	Kilos.
Copra	do			117,139	Do.
Sugar cane	do	42	159	98,823	Do.
Corn	Fair	260	326	262,700	Liters.
Mountain:					
Rice	Good	8,847	1,081	1,669,125	Do.
Sugar cane	Fair	4	4	1,518	Kilos.
Corn	do	5	727	469,950	Liters.
Coffee	do	39	26	1,472	Kilos.
Cacao	do	2	16	552	Do.
Nueva Ecija:					
Rice	Good	66,965	5	3,750	Liters.
Sugar cane	do	8	10	6,957	Kilos.
Corn	Fair	9	1,259	1,122,825	Liters.
Tobacco	do		180	16,560	Kilos.

Crops planted and harvested, etc.—Continued.

Province and crop.	Condition.	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
		Hectares.	Hectares.		
Nueva Vizcaya:					
Rice	Good	2,478			
Sugar cane	do	1	40	25,173	Kilos.
Corn	do	15	110	84,525	Liters.
Coffee	Fair	1	3	230	Kilos.
Occidental Negros:					
Rice	do	14,482	408	420,000	Liters.
Abaca	Good	245	390	104,727	Kilos.
Copra	do			287,851	Do.
Sugar cane	do	941	815	1,074,997	Do.
Corn	Fair	1,196	2,613	2,847,450	Liters.
Oriental Negros:					
Rice	do	1,112	525	668,250	Do.
Abaca	do	155	2,577	1,285,177	Kilos.
Copra	Good			282,424	Do.
Sugar cane	Fair	365	5	3,795	Do.
Corn	do	2,907	9,187	6,666,000	Liters.
Palawan:					
Rice	Good	888	960	1,173,400	Do
Copra	do			43,706	Kilos.
Corn	Fair		136	102,450	Liters.
Pampanga:					
Rice	do	51,429	1,330	1,293,975	Do
Sugar cane	Good				
Corn	Fair		1,970	2,656,350	Do.
Pangasinan:					
Rice	Good	123,592	231	75,975	Do
Copra	do			157,118	Kilos.
Sugar cane	do	3	25	94,369	Do.
Corn	Fair	366	4,937	2,605,875	Liters.
Tobacco	do		55	6,026	Kilos.
Coffee	do	6	9	437	Do.
Rizal:					
Rice	do	12,025	200	709,950	Liters.
Sugar cane	do	53	11	7,400	Kilos.
Corn	do	138	631	374,925	Liters.
Samar:					
Rice	do	3,831	1,027	1,033,125	Do
Abaca	Good	3,467	4,567	2,283,388	Kilos.
Copra	Fair			973,038	Do
Sugar cane	do	392	286	220,905	Do.
Corn	Good	137	962	773,100	Liters.
Tobacco	Fair	4	63	14,490	Kilos.
Sorsogon:					
Rice	do	672	6	3,975	Liters.
Abaca	Good	209	38,938	7,053,893	Kilos.
Copra	Fair			286,522	Do
Sugar cane	do	35	183	114,482	Do.
Corn	do	110	1,378	519,000	Liters.
Tobacco	Good		14	10,534	Kilos.
Surigao:					
Abaca	Fair	36	1,744	679,052	Do
Copra	Good			160,339	Do.
Sugar cane	do	23	30	16,382	Do.
Corn	do	1,005	554	605,250	Liters.
Tobacco	Fair	4	16	4,508	Kilos.
Tarlac:					
Rice	do	57,100	54	7,500	Liters.
Sugar cane	do				
Corn	do		99	139,290	Do.
Tayabas:					
Rice	Good	9,141	382	490,050	Do.
Abaca	do	30	878	515,520	Kilos.
Copra	Fair			3,407,214	Do.
Sugar cane	Good	77	287	182,476	Do.
Corn	Fair	102	177	85,500	Liters.
Tobacco	do	5	58	38,686	Kilos.
Zambales:					
Rice	do	12,375	8	22,875	Liters.
Copra	do			949	Kilos.
Corn	do		61	33,875	Liters.
Cacao	Good	225			
Magney	do	20	9	10,436	Kilos.

NOTE.—Statistics are kept of number of coconut trees, so the number of hectares harvested can not be shown.

RANGE OF PRICES OF PHILIPPINE AGRICULTURAL PRODUCTS.

Highest and lowest prices of unhulled rice, abaca, copra, sugar, tobacco, and corn for the quarter ending September 30, 1910.

[NOTE.—75 liters=1 cavau; 68.25 kilos=1 picul; 46 kilos=1 quintal; 11.5 kilos=1 arroba.]

Province.	Unhulled rice per 75 liters.		Abaca per 68.25 kilos.		Copra per 68.25 kilos.		Sugar per 58.25 kilos.		Tobacco per 46 kilos.		Corn per 75 liters.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
Aguian	4.50	2.25	18.48	5.06	10.00	3.20	8.00	6.30	22.50	6.00	4.75	1.50
Albay	4.50	2.40	11.50	5.20	12.00	4.00	8.22	6.00			4.50	1.50
Amboyan	4.50	2.25	11.00	5.06	12.30	3.70	8.22	6.00			4.50	1.50
Antique	3.50	2.10	18.00	11.00	10.00	7.10	10.00	6.00			4.00	1.50
Bataan	3.75	2.10	14.00	10.00			10.00	6.00			4.00	1.50
Batangas	4.50	2.50	16.00	8.25	13.00	6.43	9.48	7.00			5.00	2.00
Bohol	4.00	2.50					9.50	7.00			5.00	1.50
Bulacan	4.00	1.50									5.00	1.50
Cagayan	5.00	1.50									6.00	1.75
Capiz	3.75	1.50	16.00	7.00	10.00	5.70	8.00	6.00			4.50	1.25
Cavite	3.37	1.87	17.00	14.55			9.40	5.25			4.50	1.50
Cebu	5.25	2.25	16.00	6.32	13.36	5.06	9.80	5.00			5.00	2.00
Iloocos Norte	4.00	2.12					4.00	4.00			5.00	1.00
Iloocos Sur	4.50	2.25					4.00	4.50			5.00	1.00
Iloilo	4.00	2.00	16.44	12.00	12.65	6.00	9.50	5.50			5.00	1.50
Isabela	4.00	3.12									5.25	2.50
La Laguna	3.50	1.40	12.00	5.50	9.50	6.00	10.00	5.00			5.00	1.00
La Union	3.75	2.25			10.75	6.00	6.60	4.00			4.50	2.00
Leyte	5.25	1.50	14.00	6.30	12.00	6.00	10.00	5.50			5.25	2.25
Mindoro	4.00	2.50	15.00	9.00							5.00	2.00
Misamis	3.50	1.50	9.50	3.16	10.75	6.95	10.50	8.00			4.00	1.50
Moro	3.75	2.00	15.00	5.69	10.12	8.00					3.00	2.25
Negros	6.00	1.50			6.00	5.00					3.00	2.25
Northern	3.00	1.25					8.25	4.00			6.25	1.00
Nueva Ecija	4.00	3.12					11.00	5.25			4.00	1.00
Nueva Vizcaya	3.50	1.50	16.50	6.22	11.00	6.00	10.00	6.00			3.75	1.50
Oriental Negros	3.50	2.00	15.12	5.70	12.00	5.00	10.00	6.75			3.00	1.50
Palawan	3.25	2.00			11.38	6.32					2.25	2.25
Pampanga	3.75	1.75					8.85	5.00			3.75	1.50
Pangasinan	3.75	1.25			12.65	5.00	10.75	6.00			4.50	1.50
Rizal	3.37	2.25									3.50	2.00
Samar	5.00	1.50	15.00	8.45	9.25	6.00					3.50	1.50
Sorsogon	4.50	2.00	13.90	8.06	9.50	5.50	7.60	7.00			3.00	1.50
Surigao	3.00	2.20	12.65	8.00	10.00	8.00					2.25	2.25
Tarlac	4.00	1.75									2.25	1.50
Tayabas	4.00	1.50	15.00	4.50	9.50	5.70	10.00	7.50			5.25	1.40
Zambales	3.12	2.00			10.00	7.00	10.00	4.00			4.00	2.25

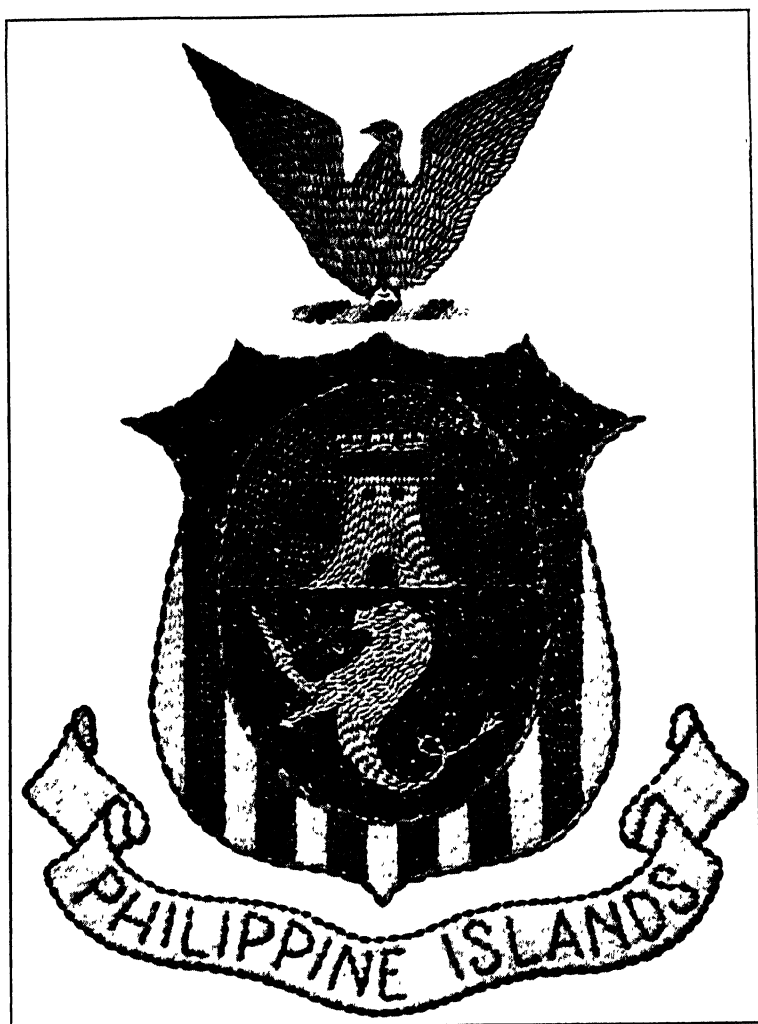


PLATE I.— COAT OF ARMS OF THE PHILIPPINE ISLANDS MADE FROM
DIFFERENT VARIETIES OF RICE RAISED IN
THE PHILIPPINES

CARNIVAL NUMBER

THE PHILIPPINE *Agricultural Review*

VOL. IV

APRIL, 1911

No. 4

CONTENTS AND ILLUSTRATIONS.

CONTENTS.

	Page.
Editorial	173
The Second Annual Live Stock Exhibit at the Carnival, by C. W. Edwards, Agricultural Inspector	176
The Provincial Exhibits at the Carnival, by E. A. Coddington, Superintendent of Publications	182
The Government Exhibits at the Carnival.....	190
Monthly Veterinary Reports	206
Monthly Crop Reports	209
Notes from Other Fields: Rubber and Cacao; Sugar Conditions in the British East Indies; Antiseptic Treatment for Hevea in Indo-China. Notes on Banana Cultivation; The Sugar Industry in Queensland.....	215
Market Reports: Notes on Manila Markets; Manila and London Fiber Market; Iloilo Sugar Market	219
Principal Philippine Imports and Exports for February.....	222
Temperature and Rainfall for February	223

ILLUSTRATIONS.

PLATE I. Coat of Arms of the Philippine Islands made from different varieties of rice raised in the Philippines.....	Frontispiece.
	Facing page—
II. (a) General view of buildings for the live stock exhibit at the Carnival. (b) Poultry exhibit at the Carnival	176
III. (a) Mestizo stallions bred by the Bureau of Agriculture. (b) Arabian mestizo stallion "Beder Junior"	178
IV. (a) Exhibit of two-year-old Nellore bulls sold at public auction by the Bureau of Agriculture. (b) Galloway-Chinese three-year-old bull....	180
V. Bureau of Agriculture exhibit of corn, coconuts, vegetables, and fruits.....	192
VI. Bureau of Agriculture exhibit of forage, vegetables, and cacao.....	194
VII. Fiber exhibit of the Bureau of Agriculture	196
101826	173

EDITORIAL.

THE REVIEW AND THE CARNIVAL.

The first number of the PHILIPPINE AGRICULTURAL REVIEW was published in January, 1908, and in February of the same year the first Philippine Carnival was held in the city of Manila. During the past three years considerable space in the REVIEW has been devoted to the Carnival, and the March, 1910, number was issued as a special "Carnival Number." We believe that the Carnival exerts a decided influence for good on the agricultural interests of these Islands and that, in so far as it is an industrial exposition, there should be this permanent record published and distributed each year. For this reason the present number of the REVIEW is devoted largely to articles descriptive of the agricultural and other industrial features of the 1911 Carnival.

THE CARNIVAL AS A FACTOR IN AGRICULTURAL DEVELOPMENT.

At each succeeding Carnival during the past four years an increasing amount of attention has been given to the industrial, and more particularly the agricultural, exhibits. Inasmuch as the preparation of these exhibits now requires each year a large amount of time and effort, and entails the expenditure of a considerable sum of money, it seems desirable to determine, in so far as it may be possible to determine, the actual results obtained by this work. Do the agricultural exhibits at the Carnival have any effect on the improvement of agricultural conditions in these Islands, and if so, in what way?

That which has contributed more than any other one thing to the improvement of agricultural conditions throughout the world has been the development of suitable means for disseminating information among the farmers. For many decades specialists and investigators have been gathering together a vast fund of information pertaining to agriculture, but it is only in very recent years that this information has been so presented to the people who are actually working the farms as to be instrumental in the production of larger and better crops. In the Philippine Islands an important and difficult problem is to bring to the attention of the farmers in a simple and yet forceful manner the need for improved methods of work and the means by which such methods can be put into practice. In this respect the Carnival exhibits and the exhibits at the provincial expositions, which may be considered as an outgrowth

of the Carnival, can not fail to exert an important influence. Included in these exhibits are the best specimens that can be obtained of all the important agricultural products of the Islands. By means of the exhibits, therefore, persons interested in agriculture are shown what results can be obtained by the use of improved methods. While it is not practicable to demonstrate to any considerable extent at the Carnival what these methods are, information regarding them can always be obtained from persons in charge of the exhibits.

A second feature of the Carnival exhibits is that they stimulate a spirit of healthy competition. This was very plainly shown at the last Carnival, where every possible effort was exerted by a large number of provinces to prepare exhibits superior to those of other competing provinces. There can be no question but that this spirit of competition will be productive of beneficial results. The person who has once taken an interest in furnishing superior articles for an exhibit will naturally, in course of time, seek to produce such superior products for his own consumption and sale.

At the present time there is a most unfortunate lack of coöperation among the farmers of these Islands. In many localities, especially in the sugar-producing provinces, conditions might be greatly improved if some scheme of effective coöperation could be established. In this respect the preparation of exhibits for the Carnival may well have an important effect in that it is a united effort to accomplish a certain definite end. The people who contribute to these exhibits are not doing something that is to give them any direct gain or personal reward, but rather something that is to reflect credit on their municipality or province. This work is essentially coöperative, and the idea of coöperation started in this manner may well be extended to industrial and business operations.

Other considerations of minor importance might be mentioned whereby the Carnival exerts an influence for the betterment of the present agricultural situation. It is believed, however, that if this influence were restricted to the three lines above mentioned, namely, educational, competitive, and coöperative, that the time, the money, and the effort that are now expended in the preparation of the Carnival exhibits would be amply justified.

THE SECOND ANNUAL LIVE-STOCK EXHIBIT AT THE CARNIVAL.

By C. W. EDWARDS, *Agricultural Inspector.*

The Carnival live-stock and poultry exhibit this year was successful to a degree exceeding even the anticipations of the most optimistic. The number of entries and the quality of stock exhibited would compare very favorably with many of our home county shows that are the result of years of endeavor and experience. Taking into consideration the fact that this was only the second exhibit of its kind ever held in the Philippine Islands and noting the great progress made in one year, the prospects for future live-stock shows look very promising indeed.

Although many of the animals exhibited were not what would be considered in show shape, they conveyed to the observer a truer conception of their real value than they would have had they been kept for some time under highly artificial conditions. Among the many obstacles encountered in preparing this exhibit were the fear of exposure of animals to infectious diseases; lack of sufficient time to put them in show condition; general uncertainty due to lack of accommodations and failure to grant substantial prizes at last year's exhibit; and the fact that the venture was still a novelty. The inducements offered by the Bureau of Agriculture, consisting of suitable quarters, free feed and attendants for animals while on exhibition, and the promise of cash prizes, aided wonderfully in overcoming these obstacles and made it possible to arouse the enthusiasm of the live-stock owners of the Islands. In the future it is intended to add to these inducements, especially in the way of larger prizes, until the stock breeders of the Islands will not only be willing but eager to enter their animals in this exposition.

A new feature of the show, instituted this year, was the auction sale, held on Monday, February 27, at the Carnival grounds. Although the attendance was small and but few private animals were sold, this event should, and probably will, become a prominent and permanent annual feature. The Bureau of Agri-

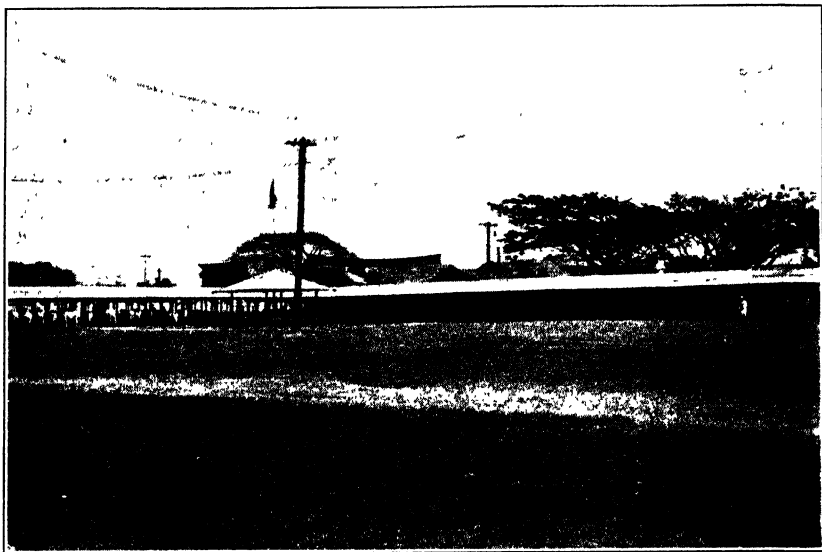


PLATE II (a) GENERAL VIEW OF BUILDINGS FOR THE LIVE-STOCK EXHIBIT
AT THE CARNIVAL

This exhibit covered a floor space of 1,1118 square meters

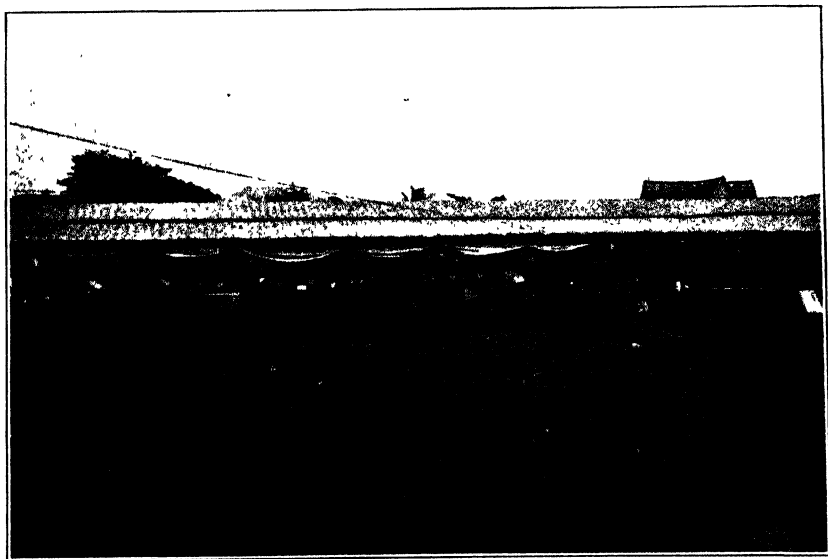


PLATE II (b) POULTRY EXHIBIT AT THE CARNIVAL

This exhibit covered a floor space of 250 square meters.

culture disposed of, among other animals, a number of fine young Arab and American-mestizo stallions, Nellóre bulls, and Berkshire pigs. The total receipts from this sale amounted to ₱5,948. Five per cent of this amount was distributed as prize money. The Government animals that won places were awarded no cash premiums, the prizes in each instance being given to the next best animal not belonging to the Government.

HORSE DIVISION.

In the horse division there were ten exhibitors with a total of thirty-five entries. The imported coach class contained only German coach mares, exhibited by Señor S. P. Sy Quia. Fourteen entries made up the light harness class. Thoroughbreds, standard-bred trotters, and high-class grades were shown. Among the imported ponies under 14 hands there were the Welsh and thoroughbreds, together with a novel exhibit of diminutive Cochin China ponies, the property of Señor Faustino Lichauco. The department of sanitation and transportation of Manila presented a very creditable exhibit in the class of foreign breeds native bred. Among the number was the beautiful stallion "Handmoyle," sired by the Bureau of Agriculture stallion "Hand-rail." The foreign-native crosses constituted the largest class, with the Bureau of Agriculture leading in the number of entries. Among the twenty head of colts entered many different crosses were represented—the offspring from native sires by American dams, and Morgan, thoroughbred, and Arab sires by native dams. The up-grading of the Filipino pony is of paramount importance to this country, consequently these crosses offered a very interesting and instructive study in determining the breed best suited for the work. The superior quality, conformation, and action of the Bureau's two and three year old Arab mestizos made them general favorites with the many visitors and offered a strong argument in favor of the use of the Arabian sire for crossing on native mares. Although few native ponies were entered, this class contained some rare 54-inch specimens, together with a few ponies of the racing type. Señor Gochuico had the largest number of entries in this class.

CATTLE DIVISION.

In this division there were twenty-one entries representing seven distinct breeds, in addition to a number of fine two-year-old Nellore bulls and bullocks exhibited by the Bureau of Agriculture and sold at the public auction. The Galloway, Angus, Hereford, and Shorthorn breeds constituted the bulk of the imported beef breed section. Señor Alberto Sisi showed some fine

specimens of the Shorthorn breed and the Bureau of Agriculture some good Hereford, Galloway, and Angus aged bulls. In the imported dairy class, the Ayrshire, Shorthorn (milking strain), and Red Poll cows from the Vaqueria de Español were typical representatives of their respective breeds and superior to the average dairy animal found in the Philippines. Señor M. Prieto exhibited two Jersey heifers and Señor Reyes one grade bull and cow. The Chinese, Indo-Chinese, and Nellore constituted the bulk of the section occupied by the imported draft breed. The Bureau's Nellore herd formed an attractive exhibit in this class. The Bureau of Agriculture was the only large exhibitor in the class of foreign-native crosses. The herd consisted mostly of calves, products of the first cross from the Angus, Galloway, and Nellore sires on Chinese and native dams, together with two fine three-year-old Galloway-Chinese grade bulls. These grades or half-breeds were not given any extra preparation for this exhibit, but taken directly from the range. For the production of a beef type animal no other breed so far introduced has proven as satisfactory as have the Galloway and Angus. Sires of these breeds when crossed upon the native stock produce an animal of good beef conformation and one that possesses the characteristic of adaptability to the conditions of this country. Until sufficient hardy forage grasses are introduced and grown successfully here the products from the infusion of pure blood, in order to be of any great value to the Filipino farmer, must be able to subsist upon the native pastures under natural conditions. The Nellore-Chinese grade calves look very promising. One would expect this cross to produce a very good type of work animal, as the Chinese dam should give the offspring body while the sire side should give sufficient height and possibly transmit to its offspring the Nellore's low susceptibility to rinderpest.

CARABAO DIVISION.

The section of imported carabaos contained a rare group of Indian milk carabaos and grades exhibited by Señor Mariano Molo, of Pasay. There are but few specimens of this breed in the Islands, and very little experimenting has been attempted in crossing them with other breeds.

SWINE DIVISION.

The only large exhibitor of swine other than the Bureau of Agriculture was Mr. E. Wickham. His contribution consisted of pure bred Berkshires, together with a number of mestizo pigs. Perhaps the most interesting part of this exhibit was a large sow of the type found upon the Jalajala estate with ten fine



PLATE III --- (a) MESTIZO STALLIONS BRED BY THE BUREAU OF AGRICULTURE

From left to right (1) Product of native sire and American dam, (2) Arab sire and native dam, (3) native sire and American dam, (4) American sire and native dam

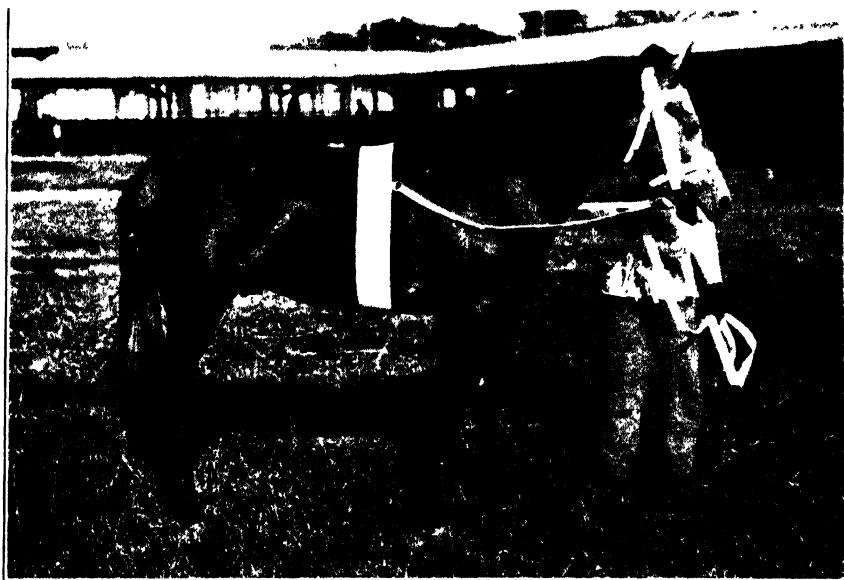


PLATE III --- (b) ARAB-NATIVE MESTIZO STALLION "BEDER JUNIOR" SIRE, ARAB STALLION "BEDER," DAM, NATIVE MARE.

This colt is typical as showing the excellent type resulting from crossing the Arabian stallion on native mares

quarter-blood Berkshire pigs. Owing to its size this native type makes a very desirable cross with pure breeds. The Bureau exhibited, besides pure blood Berkshires from Alabang, six fine individuals of this breed recently imported from New Zealand. The specimens exhibited in this division indicate that none of the native domestic animals respond as readily and satisfactorily to the infusion of pure blood as the native swine. The results from the first cross are superior to what would ordinarily be expected.

GOAT DIVISION.

This division contained Spanish and Maltese pure breeds, grades, and natives.

POULTRY DIVISION.

No doubt the greatest success of the entire exhibit was realized in this division. The result of the efforts to institute an up-to-date poultry show was a revelation to even those having the work in charge. The common remark heard from the average observer was to the effect that they did not realize there were so many pure bred fowls in the Islands. This show demonstrated that there is a keen interest being taken in the poultry-raising industry and would seem to indicate that the time is now ripe for the forming of a good active poultry association among the many Manila fanciers. If this industry develops as it should, in a few years Manila will not be importing eggs and poultry commercially from other countries. The entries represented seventeen different breeds and many crosses—Barred Plymouth Rocks, Buff Orpingtons, Silkies, Rhode Island Reds, Black Orpingtons, Black Langshans, Indian Game, Silver Laced Wyandottes, White Wyandottes, Light Brahmas, Dark Brahmas, Black Minorcas, Andalusians, American and Australian White Leghorns, Bantams, and native games. The largest number of entries appeared among the Barred Plymouth Rocks, Light Brahmas, and White Leghorns; the largest exhibitors were Señor Juan Teus, Capt. George Seaver, Mrs. A. J. Neal, and Capt. William Wolfert. One very interesting and promising feature of the show was the fine exhibits made by the Santa Cruz, Zurbaran, Pandacan, and Sampaloc Schools. These exhibits were indicative of the results accomplished by Mrs. A. J. Neal in her efforts to introduce poultry raising in the grade schools of Manila. There is no reason why poultry raising should not become one of the important industrial subjects in the curriculum of the Philippine schools. Much credit for the success of this year's poultry exhibit is due Mr. E. M. Schervenka and Mrs. A. J. Neal.

The importance of animal husbandry to the Philippines can not be overestimated. The enormous amounts of money expended each year in the importations of beef and work animals is only one of the many examples showing the necessity of increased interest and activity along this line. One of the most potent and useful factors in the furthering of this industry is the live-stock exhibit, for by this means not only is the spirit of competition aroused, but opportunity is offered for those interested to study the various pure breeds and their crosses and thus determine the particular type best suited to their conditions and needs.

As previously mentioned the obstacles encountered in preparing this exhibit are numerous, but these will gradually be overcome by offering greater inducements. In the future, with the assurance to prospective exhibitors of substantial prizes in addition to suitable accommodations, the live-stock show bids fair to become one of the leading events of the year.

Judges of the various divisions were as follows:

Horses: Señor M. Prieto, Mr. C. D. Squires, and Doctor Hill.

Cattle: Mr. W. N. Birch and Dr. J. A. Thomson.

Carabaos and swine: Mr. José Nieva.

Poultry: Mr. Charles F. Preusser and Mr. E. M. Schervenska.

Following is a list of prize winners:

HORSES.

Imported coach: Señor P. Sy Quia.

Imported light harness: Bureau of Agriculture, Mr. Frank Button, Australian Horse Bazaar.

Imported ponies under 14 hands: Mr. John Giloy, Australian Horse Bazaar, Señor Faustino Lichauco.

Foreign breeds native bred: Department of Sanitation and Transportation, Bureau of Agriculture.

Foreign native cross: Bureau of Agriculture, Señor José Aldecoa.

Native horses: Australian Horse Bazaar, Señor C. Gochuico, Señor P. Sy Quia, Bureau of Agriculture.

CATTLE.

Imported beef breeds: Bureau of Agriculture, Señor Alberto Sisi.

Imported dairy breeds: Señor Alberto Sisi.

Imported draft breeds (Chinese or Indo-Chinese): Bureau of Agriculture.

Imported draft breeds (Indian): Bureau of Agriculture.

Foreign breeds native bred: Señor Alberto Sisi, Bureau of Agriculture.

Foreign native cross: Bureau of Agriculture.

CARABAOS.

Imported (Indian): Señor Mariano Molo.



PLATE IV — (a) EXHIBIT OF TWO-YEAR-OLD NELLORE BULLS SOLD AT PUBLIC AUCTION BY THE BUREAU OF AGRICULTURE



PLATE IV (b) GALLOWAY-CHINESE THREE YEAR OLD BULL

SWINE.

Imported: Bureau of Agriculture and Mr. E. Wickham.
Foreign native cross: Mr. E. Wickham.
Native: Bureau of Agriculture.
Foreign breeds native bred: Bureau of Agriculture.

POULTRY AND PIGEONS.

Barred Plymouth Rocks: Juan Teus, Mrs. A. J. Neal, N. T. Hashim.
Foreign native cross (Game): Silvestre de Jesus.
Silkies: Mrs. A. J. Neal, Santa Cruz Primary School.
Rhode Island Reds: Santa Cruz Advanced Primary School, Mrs. A. J. Neal.
Black Orpingtons: Mrs. A. J. Neal, Santa Mesa School, N. T. Hashim.
Black Langshans: Miss Fannie McGee.
Indian Game: Juan Teus.
Native cross: J. Graham.
Silver Laced Wyandottes: Zurbaran School.
White Wyandottes: Juan Teus.
Buff Orpingtons: Juan Teus, N. T. Hashim.
Light Brahmas: Juan Teus.
Dark Brahmas: Juan Teus.
Imported native cross: Capt. William Wolfert.
Black Minorcas: Juan Teus.
Andalusians: Juan Teus.
American White Leghorns: Capt. George Seaver, Pandacan School.
Australian White Leghorns: Capt. George Seaver, N. T. Hashim.
 Best all round display of poultry, Juan Teus.
 Best display of American White Leghorns, Capt. George Seaver.
 Best display of Australian White Leghorns, Capt. George Seaver.
 Best display of Barred Plymouth Rocks, Mrs. A. J. Neal.
 Best school display: Third district, first prize—Mrs. A. J. Neal, supervisor.
 Best school display: First district, second prize—Miss Fannie McGee, supervisor.

THE PROVINCIAL EXHIBITS AT THE CARNIVAL.

By E. A. CODDINGTON, *Superintendent of Publications.*

Last year marked the beginning of a much larger interest on the part of the provinces in the exhibit of agricultural and industrial products at the Carnival. Ten provinces presented very creditable exhibits, but of these provinces three, Rizal, Albay, and Cebu, were not represented this year. However, the interest in the exposition greatly increased during the year and sixteen provinces, namely, Samar, Cavite, Bulacan, Ilocos Norte, Tarlac, Union, Iloilo, Pampanga, Bohol, Occidental Negros, Mindoro, Pangasinan, Misamis, Ilocos Sur, Surigao, and the Moro Province, were represented at the Carnival of 1911. Nine of these provinces, Ilocos Sur, Union, Tarlac, Cavite, Mindoro, Samar, Occidental Negros, Bohol, and Surigao, were not represented at the Carnival of 1910. The exhibits consisted largely of the agricultural and industrial products of the provinces and were not only a credit to the people, but much more representative and arranged in better order for exhibition than any similar exhibit at the Carnival in time past.

The provincial exhibits were arranged in two buildings which were divided into sections. These buildings were located on the right side of the Carnival grounds from the main entrance. The first building contained, besides the provincial headquarters in the first section, the exhibits of the Provinces of Samar, Cavite, Bulacan, Ilocos Norte, Tarlac, Union, and Iloilo; and the second building those of Pampanga, Bohol, Occidental Negros, Mindoro, Pangasinan, Misamis, Ilocos Sur, Surigao, and the Moro Province.

Samar.—The first of the provincial exhibitions was from Samar, and consisted for the most part of many varieties of native woods, bamboo, bejuco, and mats made from tieog grass. One of these mats was very artistically woven into a map of the Philippine Islands. Besides these there were exhibits of shells, sarsaparilla and other medicinal roots, coal, a small exhibit of

abacá, baskets made of bejuco and bamboo, and about fifteen kinds of dried fish. These exhibits represented Samar's first attempt to compete with the other provinces at the Carnival.

Cavite.—The next exhibition was that from the Province of Cavite, which was very interesting and consisted of a large and representative variety of products not only of the agriculture of the province, such as sugar cane, fruits, tobacco, native vegetables, and a number of varieties of rice, but products from the forests, such as native woods, cabo-negro (*Arenga saccharifera*) and its by-products, furniture, and carved bamboo. There were also exhibits of the products of the native shops and factories, such as bolos, sickles, native hoes, tongs, and other tools made in the many small shops found in different parts of this province. There was an interesting exhibit of sinamay cloth, the weaving of which is carried on rather extensively in the towns of Indang, Rosario, Alfonso, and Silang. There were bottles of preserved fruits, mats, bead work, and many fancy articles representing the household industries of the province. There was also a small exhibit of salacots and native hats which were very attractive. The industrial exhibit of the province included small models of the native rice mills, salt works, and fish traps which are scattered over Cavite Province.

Bulacan.—The principal feature of the exhibit from this province consisted of jusi and silk cloth from Baliuag and Hagonoy. There were also many fine specimens of Baliuag hats, which are among the very best made in the Islands. An exhibit of knives, working bolos, plowpoints, shares, and other implements, some of which were made from iron which is mined near Angat, represented a very important industry. The work of the women of the province was well represented by samples of mats, bead baskets, and a variety of fancy articles. This exhibit while comparatively small was very neatly arranged. The agricultural exhibit scarcely did justice to its agricultural interests.

Ilocos Norte.—The exhibition from Ilocos Norte was remarkable for the many samples of cloth of various kinds, including cloth for mens' suits, blankets, bed covers, towels, pillow covers, and cotton cloths of many kinds woven on the looms found in many of the homes of the Ilocano people. The Ilocos Provinces have justly become famous for the manufacture of these cloths and the exhibit of Ilocos Norte did great credit to this industry, which is one of the leading industries in the province. There was a good exhibit of maguey, the growing of which is a prominent industry in this province. Besides these exhibits

there was a small exhibit of furniture made from bámbúo and bejuco, also a small exhibit of tools, such as hatchets, bolos, and chisels.

Tarlac.—The exhibition from Tarlac was very interesting and representative of its leading industries. It included specimens of jars, bricks, and pilones (bell-shaped sugar containers) made in the kilns and potteries of the province for various industrial and commercial uses. There was also a very interesting exhibit of hand work by women, including pillow covers, ties, handkerchiefs, baskets, fans, artificial flowers, and other fancy articles. There were about thirty samples of woods found in different parts of the province, weaving frames and looms, samples of blankets woven on native looms, and about thirty-five different grades of native rope. The agricultural exhibit consisted largely of samples of many varieties of rice, sugar cane, corn, and tobacco, besides a collection of vegetables, including cabbage, eggplant, camotes, peanuts, and fruits, such as bananas and coconuts; in this division there were several models of native agricultural implements. The ceiling of the section was attractively decorated with heads of rice, and the posts at the entrance were tastefully covered with heads of rice and ears of corn.

Union.—The next section in this building contained the exhibits from Union Province. These exhibits included some excellent specimens of fancy work with shells, some of them were made into trays and picture frames, while others were cut to represent flowers. There were also some very attractive specimens of carabao horn and various small articles manufactured from it. Besides these fancy articles there were many small models of carved boats, sleds, and coconut bowls. In this section was a variety of baskets woven from bámbúo and bejuco. Perhaps the most prominent feature of the exhibit was the samples of native cloths similar to those made in the Ilocos Provinces; many of the pieces were woven into useful articles, such as bed covers, tablecloths, towels, etc. This exhibit, while interesting, did not do justice to the farmers of the province; there were no exhibits of the three leading crops, namely, rice, tobacco, and corn.

Iloilo.—The last three sections of this building were occupied by the excellent exhibition from Iloilo Province. One of the most interesting features of the Iloilo exhibit was the hats made in Pototan and other towns of the province. There were many fine products of the weaving industry, which is one of the most important occupations of the women on the Island of Panay. The fine collection of piña, jusi, and sinamay cloth could scarcely be excelled anywhere in the Islands. There were

several demonstration looms in operation showing how the different kinds of native cloth are woven. One of the most interesting features in connection with the weaving industry in the Island of Panay was a demonstration of the native method of carding and spinning Philippine silk. The agricultural exhibit was one of the most attractive features of the Carnival exposition and included not only a large variety of agricultural products, but showed that progress is being made in raising the different products of the farms; it showed clearly that Iloilo Province is in its agricultural development far ahead of most provinces in the Philippines. The agricultural exhibit occupied all of one end of the three sections devoted to the Iloilo exhibit. In the right-hand corner was a large pyramid of cotton, and to the left of this were many samples of tobacco, sugar cane, abacá, rice, corn, peanuts, coconuts, and other farm products so arranged as to make them decidedly interesting and representative of the important place which farming holds in Iloilo Province. An interesting feature of this exhibit was the demonstration work in the making of bamboo chairs and furniture which occupied a booth in one of the sections assigned to this province. Another booth in this exhibit contained specimens of stone bowls, mills for grinding corn, lawn tables, plant stands, monument stones, etc., representing an important industry in the town of Guimbal.

Pampanga.—The first exhibition in the second provincial building, and one of the most interesting of the provincial exhibits, was that from Pampanga. It included many samples of sugar, including crude sugar in sacks and pilones, also blocks and small jars of sugar, some confections, canned fruits, etc. At the entrance of the exhibition was a striking display representing the Pampanga sugar industry consisting of a pyramid about five feet in height composed of solid blocks of crude sugar. The growing of sugar cane is the leading industry in this province. The agricultural exhibit included many samples of rice, sugar cane, Mexican June corn, tobacco, vegetables, and fruits. The display of vegetables consisted of potatoes, melons, cabbage, beets, peanuts, etc., while the principal fruits displayed were mangoes, bananas, lemons, and coconuts; this exhibit included a number of agricultural implements, working bolos, and other farm tools. Other industries of the province were represented by many pieces of furniture, including chairs, tables, wardrobes, and cabinets, a number of which were beautifully inlaid with mother-of-pearl, musical instruments, native hats, and the products of the distilleries in the province. Pampanga won the

first prize for the best agricultural exhibit at the Carnival in 1910.

Bohol.—The exhibition by the Province of Bohol was the first which this province has made at the Carnival. It consisted principally of rice, copra, maguey, abacá, shells, mats, and sinamay cloth. Besides these products there were on exhibit samples of furniture, buri, bead work, and buttons made from coconut shell. At the entrance of the exhibit was a cage of bats or flying lemurs, called "caguans" which attracted much attention. The caguan is an animal somewhat resembling the flying squirrel, and so far as known is found only in Bohol. This animal produces the most beautiful and valuable fur found in the Islands. Visitors were given very neat folders giving a brief sketch of the history of the province, its population, area, points of interest, and an account of the principal agricultural and industrial products of the Island. In this folder we find the following: "The Bohol exhibition at the Philippine Carnival for 1911 is only a 'trial' or 'practice' exhibition, and Bohol intends to fully utilize the experience gained in 1911 for the Carnival in 1912."

Occidental Negros.—The agricultural part of this exhibit consisted mostly of about ninety varieties of rice, some corn, copra, tobacco, hemp, cotton, peanuts, and a number of different sizes and models of the Vargas plow, which is largely used in the Islands of Panay and Negros. There was a considerable exhibit representing the fishing industry, which included fish traps, nets, baskets, and other fishing equipment, also a quantity of shells and sea products. There were a number of samples of jusi and piña cloth showing that the weaving industry is prominent in the province. Other industries of the province were represented by musical instruments, baskets, specimens of pottery, petates, rope, hats, and canes. The natural resources of the province were represented by exhibits of coal, dammara, bejuco, sulphur, and beeswax.

Mindoro.—One of the most interesting of the provincial exhibits was that from the Island of Mindoro. The first display that attracted attention on entering this section was the fine samples of abacá (Manila hemp) from the Aldames plantation. This hemp was taken from a camarin at one of the principal ports of Mindoro and represented the quality of hemp which is being produced and shipped from that province. The color, fineness, and cleanness of the fiber will certainly enable it to command a high price in the best hemp markets. Following the hemp exhibits there were some fine samples of ebony logs which were brought to Manila, just as they had been fallen and trimmed, for

exhibition. The forestry exhibit included a forest map of the island and about 75 samples of woods growing in the forests of Mindoro. Perhaps one of the most attractive features of this exhibit was the many varieties of orchids on exhibition and for sale, which attracted the many admirers of this plant. There were samples of coal, coconuts, sponges, tobacco, bejuco, rice, etc. There were photographs showing the progress already made on the plantation of the Mindoro Development Company. Judging from the character of Mindoro's exhibit at this year's Carnival, something of much greater interest representing the agricultural, industrial, and natural resources of this great island may be expected in the exhibit from Mindoro for the coming year.

Pangasinan.—The exhibition of Pangasinan was one of the most attractive of the provincial exhibits. On the walls of this section were arranged large and artistically framed photographs of the public buildings, roads, and bridges of Pangasinan, which is said to be the banner road province of the Philippines. The agricultural exhibit consisted principally of rice, tobacco, and coconuts. At the back of the section there was a very neatly arranged booth which was devoted almost entirely to an exhibit of the different varieties of rice and tobacco grown in Pangasinan; there was also a fine exhibit of a large variety of vegetables grown in the province.

The industrial exhibit covered a variety of industries. Perhaps the most prominent of these was the exhibition of hats from the town of Calasiao. This town is famous not only throughout the Philippine Islands but in other countries for the fine grade of hats which it produces. The weaving exhibit included a model loom used for demonstrating the work of making "sedalina" cloth (imitation silk) as it is done in Pangasinan. There were many samples of blankets, cloths, and other woven articles. A number of specimens of fine handiwork, such as women's gowns, pillow covers, fascinators, and fancy work, represented the industries carried on by the women of the province. There was an interesting exhibit of fishing paraphernalia, such as traps, nets, seines, etc., which represents a well-developed industry of many of the people. The dyeing industry was represented by a small model of one of the native dyeing establishments of the province. Another industry represented was furniture making; there were several samples of furniture which were of original design and well made. There was also a small exhibit of minerals, woods, picture frames, and shell ornaments.

Misamis.—While the exhibit from Misamis was small as compared with that of some provinces it was interesting in that it

showed that considerable progress is being made in the development of the resources of this distant province. The exhibit consisted principally of samples of woods, abacá, rice, coconuts, bejuco, shells, etc. There was a good exhibit of manufactured articles consisting of furniture, hats, mats, sinamay cloth, spreads, towels, curtains, and a model of a native plow used by the farmers of the province.

Ilocos Sur.—From an industrial standpoint this was the most interesting exhibit from the provinces. The principal industries represented were carriage making, harness making, saddle making, weaving, wood carving, and silversmithing. There were three very fine samples of work in carriage making—a calesa, carromata, and a quiles, all of which did very great credit to the representatives of this trade. Some excellent samples of saddles, of single and doubleharness, and men's shoes testified to the ability of the workers in leather. The exhibit of Ilocano cloth was especially attractive and contained some very fine blankets, a variety of cotton cloths for suitings, towels, and almost everything in this line which can be made on the hand looms used. This part of the exhibit included four demonstration looms which were being operated for the purpose of demonstrating the manner of making the different kinds of cloth which are woven in the province; there was also a demonstration of the making of Tinguian cloth by one of the women of this tribe which forms a part of the population of Ilocos Sur. There were some good samples of work in wood carving and a number of fancy articles in silver. The agricultural exhibit consisted of a number of samples of rice, corn, sugar cane, coconuts, tobacco, maguey, and a variety of vegetables.

Surigao.—The exhibit from Surigao consisted principally of its forest and mineral products. The forest products were represented by many samples of woods, including red narra, camagon, molave, and bejuco. There was a very good specimen of a table the top of which was made from one piece of narra, also a number of large bowls made from one piece of wood, some of which were more than 4 feet across. There were many spools of hemp fiber prepared for use in weaving sinamay cloth, a number of shells, samples of coal, some bead work, baskets, fancy work, and chalk, also a variety of vegetables and fruits.

Moro Province.—To many the exhibit of the Moro Province was the most interesting of all. In this exhibit all of the different districts of the province were represented. There was a very large and attractively arranged exhibit of brass drums,

gongs, vases, bowls, betel-nut boxes, pots, trays, etc. Moro cloth, Bagobo bead work and clothing, Sulu cloths, a collection of tortoise and pearl shells, Moro spears, krises, campilans, shields, lantacas or Moro cannon, and a variety of bolos for use in war as well as in agriculture, formed a prominent part of the exhibit.

The principal agricultural and industrial exhibits were some very fine samples of abacá (Manila hemp) from Davao, a good collection of coconuts, gutta-percha, dyewoods, cinnamon bark, wax, copra, sponges, a variety of seeds, and a fine collection of the woods found in Mindanao.

This year the Carnival board of directors gave more attention than ever before to the agricultural and industrial features, and the results were manifest in all of the provincial exhibits. The judges of these exhibits announced their decisions on Wednesday, February 22, as follows:

Silver cup for the best provincial exhibit, Iloilo; second prize, silver medal, Occidental Negros.

Silver cup for the best agricultural exhibit, Pampanga; second prize, silver medal, Pangasinan.

Silver cup for the best industrial exhibit, Ilocos Sur; second prize, silver medal, Tarlac.

Silver cup for the most artistic display, Moro Province; silver medal, second prize, Surigao.

THE GOVERNMENT EXHIBITS AT THE CARNIVAL.

INTRODUCTION.

At the Carnival of 1911 eight Bureaus of the Government of the Philippine Islands, namely Education, Printing, Public Works, Health, Agriculture, Internal Revenue, Science, and Forestry presented exhibits for the purpose of showing the importance of the work which they are doing for the improvement of the health, knowledge, and material welfare of the people of these Islands. The exhibits of the Bureaus of Health, Agriculture, Internal Revenue, Science, and Forestry were displayed in a single building, while the Bureaus of Education, Printing, and Public Works had separate buildings devoted to their respective exhibits. The exhibits made by the different Government Bureaus at the Carnival of 1911 were superior to those of any previous Carnival, and there can be no question but these exhibits are becoming each year more and more valuable as a means of showing the general public the details of some of the more important lines of work of the Government Bureaus.

THE BUREAU OF HEALTH.

The exhibit of the Bureau of Health was appropriately placed next to the exhibit of the Bureau of Agriculture, the two booths having a common entrance.

Health and agriculture vitally concern the Filipino people and constitute the basis of their future prosperity. If between health and agriculture there be inserted education, a trinity of factors is presented upon which depends the development of the race. Health is given first place because no nation or people can attain to the highest success without the blessings of health.

The purpose of the Bureau of Health exhibit was to illustrate, in a simple way, the possibilities of health culture as the Bureau of Agriculture showed the possibilities of the soil under proper cultivation.

The first exhibit after passing through the entrance was a miniature model of a nipa house having sleeping porches, perfectly ventilated, a cement drain for the yard, a sanitary kitchen, and sanitary appointments. If nipa houses are properly constructed they are the most sanitary houses that can be built.

The next exhibit in the aisle was a model of Santa Monica barrio in Tondo, showing the haphazard arrangement of the houses with reference to alignment and street lines; their crowding together like dwarfed trees in a jungle, and the insanitary, imperfectly drained ground space that can never be kept clean.

The third exhibit showed Santa Monica barrio as it will appear when it is made a sanitary barrio. The difference between an ordinary barrio and a sanitary barrio is the difference between order and chaos.

The sanitary barrio system requires that each house front either on a street or an alley. If there be no alleys they are made. This necessitates the destruction of some houses and the removal of others so that there may be perfect alignment and free ventilation. The ground space is drained and cross drained until it is dry. All hidden places are uncovered so that the interspaces are accessible to the health-giving rays of the sun and to unobstructed, uncontaminated currents of air. With model houses erected in sanitary barrios, former pest holes of Manila will become veritable health resorts.

The fourth exhibit showed the septic-vault system, with its filtering and absorbing compartments, which was devised a few years ago by a British engineer and put into operation in certain parts of England. This system has been successfully used in Manila and is the next best thing to the modern sanitary sewer.

The fifth exhibit was that of a miniature estero with a retaining wall along its entire length and a section of low land that had been filled and raised to the proper level, according to the plan contemplated in the proposed scheme of municipal improvements.

The sixth exhibit showed a municipal filter system and graphically illustrated how water is rendered pure by underground percolation.

The seventh exhibit was that of a mountain barrio, showing the difference, with reference to purity, between surface water and artesian-well water. The miniature old-fashioned well and the artesian well, being exact in structure, showed how impossible it is to keep the one from becoming contaminated and how well protected is the other. One of the principal disadvantages of provincial life has been the water supply. This has been overcome by deep artesian wells.

The eighth exhibit was a model of a provincial dry-earth closet designed to replace the insanitary structures that time will doom to destruction with not a single protest from anybody.

On the two sides of the aisle were arranged large shelves on which were placed various exhibits. Beginning with the left-hand side there was a graphic representation by test tubes and drawings of the nutritive values of different native foods and their relative cost. This exhibit while probably not understood by all the visitors was one of the most instructive and most scientific displays of the Carnival. Supplementing this exhibit were artistically prepared charts illustrating cheap balanced rations for each day of the week with suggestions for appropriate daily variations.

The second shelf exhibit consisted of samples of polished and unpolished rice, teaching a lesson with regard to beriberi. It is now known that eaters of polished rice frequently have beriberi and that the substitution of the unpolished rice for the polished rice causes the disease to disappear. Beriberi mothers impart the disease, which is very fatal to nursing infants, through the milk. The remedy is to withdraw the infant from the breast and substitute artificial feeding until the mother can be cured by proper food. In all Government institutions polished rice is forbidden, and its importation may be the subject of legal restriction by the next Legislature. Beriberi is no longer a disease in institutions where unpolished rice is used. It has been entirely eradicated from Bilibid Prison, Iwahig penal colony, Culion leper colony, the San Lazaro Hospitals, and the tuberculosis camps of the Bureau of Health.

Next to the beriberi exhibit were a number of glass jars showing the mosquito-breeding process and how the larvæ can be destroyed by petroleum. This exhibit showed miniature beds with sleepers protected and unprotected from mosquitoes, and was supplemented by charts showing the mosquito in action, thus illustrating how malaria and other mosquito-born diseases are transmitted. The different phases or cycles of the life of the mosquito were fully explained by charts, which also set forth the names of the disease for which the mosquito can be blamed. When it is remembered that malaria, dengue, yellow fever, and filariasis are conveyed by mosquitoes, the importance of instruction along this line will be recognized.

After the mosquito exhibit came the fly-breeding exhibit, which consisted of jars of stable refuse in which flies were being incubated and hatched. Flies are the enemies of sanitation. They may carry the germs of cholera, dysentery, typhoid, and nearly all intestinal diseases and undoubtedly have a part in the dissemination of tuberculosis, pneumonia, and other dangerous communicable diseases, all of which was forcibly impressed on

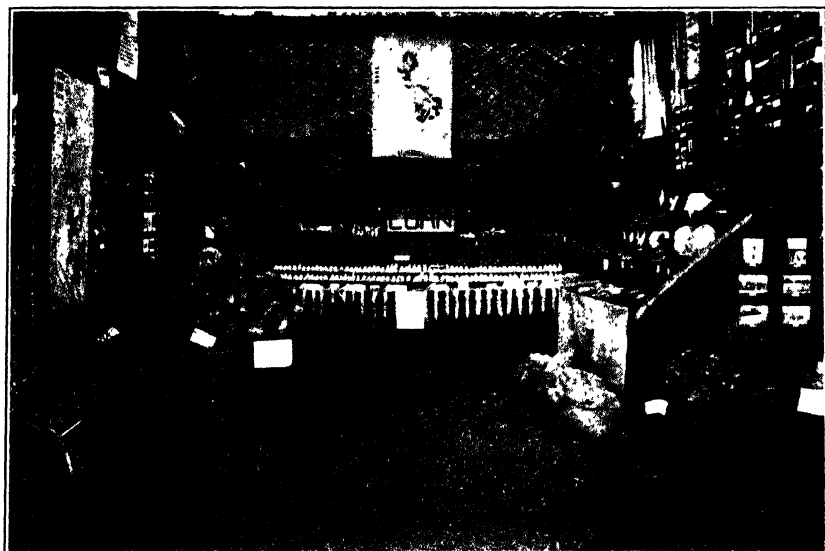


PLATE V — BUREAU OF AGRICULTURE EXHIBIT OF CORN COCONUTS,
VEGETABLES, AND FRUITS

the public by the charts accompanying this exhibit. May the time come when the fly will be in as bad repute as the bedbug.

Near the rear of the booth was the milk exhibit, which consisted of a collection of milk containers varying from the bamboo joint to the impervious galvanized metal can with tight-fitting top which is now required by the Bureau of Health. Analyses setting forth the improvement of the milk supply under the new sanitary regulations were displayed in chart form. The exhibit was supplemented by photographs showing the *before* and the *after* of the milk business in Manila and the difficulties which confront the Bureau of Health in its campaign for pure milk and healthy babies.

On the right-hand side of the entrance to the booth between the passageway to the booth of the Bureau of Agriculture and the doorway was arranged a series of pictures portraying cholera and tuberculosis. The cholera exhibit consisted of two pictures; the first showed a family eating out of a common dish with their fingers and illustrated how the disease is frequently conveyed, while the second showed a family that used knives, forks, and spoons, thus avoiding contamination of food by soiled fingers. Some one has said "no house, no tuberculosis." It might be said with equal truth, so far as the Philippine Islands are concerned, *no fingers, no cholera*.

Side by side with the cholera picture was a series of four pictures, numbered from one to four, with the following significations:

1. A father with consumption coughing and spitting on the floor.
2. An only child crawling on the sputum soiled floor.
3. The sickness and death of the child from tuberculosis.
4. The burial of the little one and the sadness of the heartbroken mother and the death-doomed father in their childless home from which the last ray of hope had departed.

American and Filipino employees were present during Carnival hours to explain the significance of the exhibits and charts and to emphasize the warning "DON'T SPIT."

THE BUREAU OF AGRICULTURE.

The Bureau of Agriculture exhibit at the 1911 Philippine Carnival was designed to show to the fullest possible extent the present agricultural conditions of the Islands and to illustrate the possibilities of improvement along different lines of agricultural work. In most cases, both the common and improved types of products were exhibited in order to show what can be done by better agricultural methods.

The fiber exhibit was probably the most comprehensive that has ever been seen in the Philippines. Almost all known varieties of commercial Philippine fibers were shown, and in most cases were supplemented by articles of native manufacture to demonstrate their economic value. Growing plants of abacá, maguey, sisal, cotton, and sansevieria were shown in connection with the fibers and fiber products.

Manila hemp (abacá), the principal Philippine export, naturally comprised the most important part of the exhibit. A large number of samples of both machine and hand stripped fiber, from all of the principal abacá-producing sections of the Archipelago, were on exhibition. Samples of fiber, both loose and in miniature bales, were arranged so as to show the different commercial grades. The advantages of improved methods of stripping were illustrated by a comparison of samples that were produced by the crude native process of hand stripping and by modern fiber-stripping machinery. An interesting collection of native abacá cloths, harness, and other products was shown. An excellent exhibit of abacá rope, both oiled and natural, ranging in size from heavy cables to wrapping twine, was contributed by the Pickett-Johnson Rope Company.

First-grade samples of machine-cleaned maguey fiber from Cebu, hand-cleaned fiber from the Ilocos Provinces, and several pieces of maguey cloth from different provinces were shown. Fine samples of pineapple fiber (piña) and the highly prized piña cloth from various provinces were shown. White and brown cotton from Cebu, Ilocos Norte, and Ilocos Sur; buri, different varieties of banana fibers, cabo-negro, sansevieria, nito, etc., were exhibited in an attractive manner, also hats, mats, baskets, and other articles made from native fibers.

The rice exhibit comprised over 200 varieties of rice, both lowland and upland, grown principally at the Alabang stock farm and in the Province of Iloilo. The exhibit was arranged so as to show most of the varieties in both the hulled and unhulled state; many of the rice samples were also shown in the head. A large shock of Alabang rice, composed of sheaves of the entire plants, formed an attractive center of the rice exhibit. Several glass cases showing the comparative size and length of the grains of different varieties of Philippine rice was a very instructive feature of the exhibit. The coat of arms of the Philippine Islands, made from different varieties of rice grown in the Islands, was a part of the rice exhibit that attracted a great deal of attention.

The possibilities of profitable corn culture in the Philippines



PLATE VI.- BUREAU OF AGRICULTURE EXHIBIT OF FORAGE, VEGETABLES,
AND CACAO

were shown in a very striking manner. Samples of Mexican June corn grown by an American farmer in the Province of La Laguna showed beyond all doubt that the very best grades of corn can be grown in the Islands. Several varieties of native corn, improved and unimproved, and hybrids of foreign and native crosses were shown. Sheaves of green corn on the stalk from Lamao experiment station and Alabang stock farm were excellent examples of the advantages of proper cultural methods.

A complete collection of the commercial grades of crude sugar from Iloilo was the most striking feature of the sugar exhibit. Common varieties of sugar cane from Pampanga and Occidental Negros, two samples of very large cane from La Carlota, and several samples from other cane-producing provinces gave a good idea of the general quality of sugar cane produced in the Philippines.

The coconut exhibit included practically all varieties of coconuts grown in the Islands. The general collection of nuts was obtained from a number of different provinces, while two especially large nuts, one of which measured 89 centimeters in circumference, came from Pangasinan. Commercial samples of copra and a model of a native machine for extracting copra from the shell were shown. Especially unique features of this exhibit were two seedling coconuts from Iloilo containing two and three sprouts respectively. It is very seldom that more than one sprout breaks through the husk of the nut.

In the tobacco exhibit, samples from all tobacco-producing sections of the Islands were shown. Tobacco cured properly and that cured by the crude methods commonly practiced were exhibited together in order to illustrate the advantages of the former method. The samples from the Cagayan Valley, Panay, and Isabela were especially good.

Green coffee in the drupe from Iloilo and ripe Liberian coffee on the branch from Lamao were displayed. Cacao in the pod from Batangas and the dried beans from Iloilo were shown.

The forage exhibit was a good example of the work that is being done in the introduction of valuable economic plants into the Philippines. Growing plants of guinea grass and Pará grass, sheaves of the same grasses, and sheaves of sorghum and corn were exhibited. Ground foods for both stock and human consumption were contributed by the Pandacan Forage Factory.

The exhibit of fresh fruits and vegetables received daily from the Baguio experiment station and the fruits and vegetables from Lamao experiment station was especially interesting. Fresh strawberries, celery, and cabbages from Baguio, and fine water-

melons from Lamao attracted a great deal of attention from Carnival visitors.

The rubber exhibit was made up of a number of Pará seedlings from the Singalong experiment station and a sample of Ceara rubber from La Carlota. Pamphlets explaining the care and cultivation of rubber seedlings were distributed.

Mr. R. L. Clute showed an interesting exhibit demonstrating some fundamental principles of practical agriculture. The exhibit included plants growing under control. It was demonstrated that plants can be fed and watered and that their growth depends on the amount of food, water, and air in the soil. It was shown that peanut plants, horse manure, lumbang cake, tankage, nitrate of soda, muriate of potash, and sulphate of ammonia contain food for maize plants; that water and abundant air are necessary for the germination of seed; that the surface soil contains more food for plants than the subsoil; and that maize plants grow better when the soil is drained. Radishes grown from large seed were about six times larger than those grown from small seed. By the use of an egg it was shown how soil water enters the roots of plants; by placing a tumbler over a leaf it was shown that leaves give off water.

Good seeds will germinate and good plants will grow if they have what they need. In a measure each farmer should become an experimenter. He should learn how to economically feed and water his plants. The demonstrations were explained to the people by three pupils from the Sampaloc Intermediate School.

The general exhibit included different kinds of native agricultural implements, several varieties of indigenous root crops, growing bananas and vegetables from Singalong, and a number of miscellaneous products.

The exhibits were supplemented by photographs and statistical tables and maps. The maps showed at a glance the parts of the Islands where certain crops were of the most importance, while the tables gave the exact amounts produced in each province. Sets of the PHILIPPINE AGRICULTURAL REVIEW, Year Books and bulletins of the United States Department of Agriculture, and agricultural bulletins issued by the Philippine Bureau of Agriculture were distributed.

BUREAU OF INTERNAL REVENUE.

The greater part of this exhibit was made for the purpose of further demonstrating to the public the uses of denatured alcohol for light, heat, and power. A decidedly superior illumination was noticeable from lamps burning denatured alcohol. Stoves,

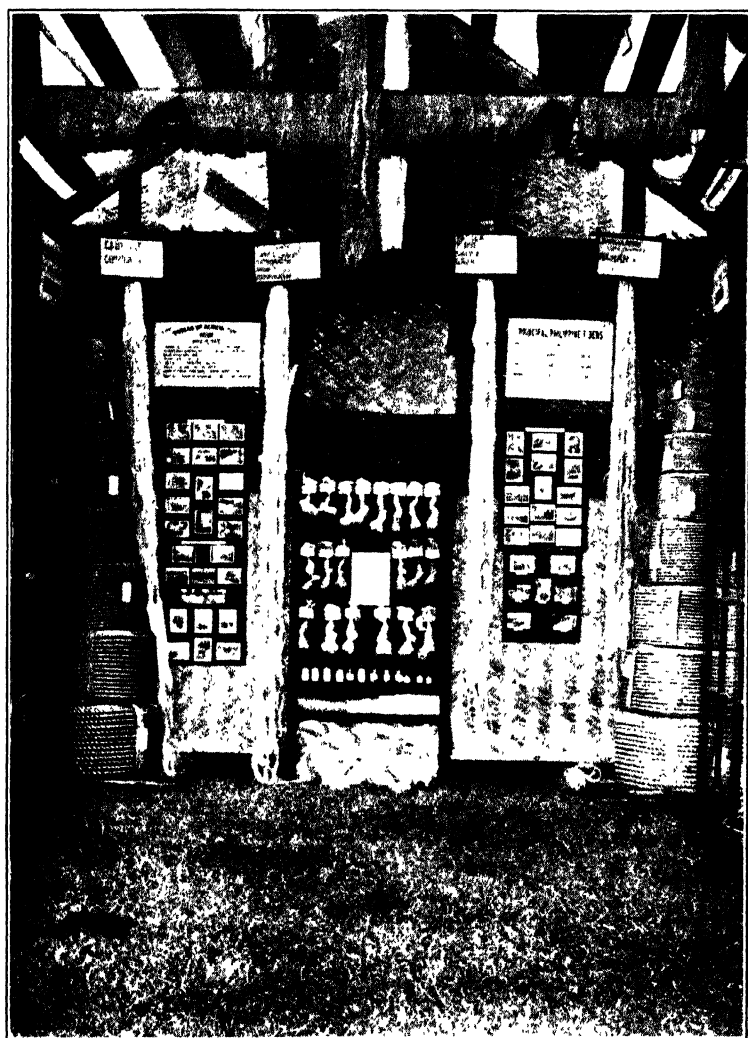


PLATE VII — FIBER EXHIBIT OF THE BUREAU OF AGRICULTURE

flatirons, and other implements of domestic use burning alcohol were loaned by various Manila dealers in order that their value might be demonstrated to the public. Stoves and denatured alcohol were furnished through the Bureau of Internal Revenue for the cookery exhibit of the Bureau of Education and used under the supervision of its agents. It was conclusively demonstrated that denatured alcohol is an entire success in the kitchen; one great advantage over kerosene being the absence of the disagreeable odor which always accompanies the latter.

A portion of the exhibit of the Bureau was given over to showing the development of the alcohol industry since the passage of the Internal Revenue Law in 1904. In 1907, after two years of work and practical demonstrations, the distillers of the Philippines were induced to use modern equipment for distilling; working models of the present equipment were shown, with photographs of various types of distilleries and of the nipa and coconut regions in which alcohol is manufactured. In 1905 nearly 400 distilleries were in operation, 5,483,690 proof liters were distilled, and the tax collected was ₱1,096,738. During the fiscal year 1910 the number of distilleries was reduced to 68, all under modern conditions, 10,584,124 proofs liters were produced, and the tax collections amounted to ₱2,269,160.

BUREAU OF SCIENCE.

The Bureau of Science again this year made an exhibit of silkworms, cocoons, and spun and woven silk. An improvement was made over the exhibit of last year in that instead of the large, complicated, power driven, reeling machine small hand machines were in operation. These hand machines are so simple and inexpensive that the humblest Filipino can have one in his home. This will make possible the introduction of the silk-producing industry into the Philippines. As the silkworm breeds here at the rate of eight generations a year, the production of silk should prove a profitable industry.

Another Philippine industry capable of development is that of fishery. The division of fisheries made an interesting exhibit of food fishes preserved in jars of formalin. But perhaps the most promising business in connection with Philippine fisheries is the possibility of establishing a sardine cannery. Philippine waters abound in sardines and anchovies, and there is no reason why a profitable industry in canning them could not be established.

A handsome screen made of window shell and narra, and porch lights made of narra and sheet brass were also shown. In the same section "La Concha" had an interesting exhibit of a great variety of articles made of mother of pearl.

The division of mines exhibited coal-cutting machinery from Batan, mineral models, and relief maps. The most striking part of the exhibit of this division was a complete model of a cyanide mill for extracting gold from ore. Every part of the process was shown, from the dumping of the ore from the cars into the mill to the final extraction of the gold from the solution. The models of gold bars showing the output of gold for the years 1907, 1908, 1909, and 1910 indicated a marked falling off in the production from 1909 to 1910. This was due partly to the wrecking of one of the Benguet mills by a flood, and partly to the fact that one of the dredges at Paracale was out of repair for some months.

BUREAU OF FORESTRY.

Next to the exhibits of the Bureaus of Education and Printing, that of the Bureau of Forestry was the most extensive of the eight Government exhibits. Not only was it larger than the 1910 exhibit, but a greater variety of forest products was shown than at any previous Carnival.

The walls were completely lined with a collection of 10-foot planks from the Forestry Museum. The number of species represented by these planks has been greatly increased during the past year, so that there remain but few well-known and plentiful timbers to be added. Of the Lauan family (*Dipterocarpaceæ*), for instance, planks were shown representing all of these very abundant woods except bagtican-lauan (*Parashorea plicata*). Similarly, in the Narra family (*Leguminosæ*), of the seven most important woods, narra, ipil, banuyo, acle, tindalo, supa, and balete, all except the last were represented by magnificent planks. Besides these two, there were planks of twenty-four other families which, with other exhibits such as logs and manufactured articles, brought the total number of timber species in the exhibit up to over one hundred and forty. Among the planks three attracted much attention; these were one of ipil, 35 inches by 25 feet, for which there was no space in the exhibit to show it to advantage, and one each of molave and acle, 42 and 35 inches wide, respectively, which stood on end on the floor with their corners touching the canvas roof 18 feet above.

A striking feature of the exhibit was the number of one-piece table tops displayed, ranging from a glittering gem 50 by 80 centimeters, of dao, to the huge lauan table 2.92 meters in diameter, on which the incredulous public wasted hours of time trying to find the joints. Equally conspicuous were many other pieces of finely finished furniture of various woods, loaned to

the exhibit by private individuals and by manufacturers, while everywhere, on walls, tables, and suspended under the roof, were numberless articles of use or ornament in house, field, and forest, manufactured of almost every conceivable forest product, from palm leaves and rattans to molave and mancono. Among the raw products, the most conspicuous were the exhibits of gutta-percha and dammara (almaciga). The collection of dammara was probably the best ever gathered in the Philippines, including, as it does, half a dozen specimens ranging from 35 to 44 kilos, and scores of smaller pieces, of every color from black to the purest amber.

Add to the variety of fantastic shapes and gorgeous colors displayed, the attractions of masses of green in every available space, and of a multitude of chairs and benches, and it is not surprising that the foot-weary sightseer often spent an hour or more drifting from one seat to another before going out again into the noise, glare, and confetti.

BUREAU OF EDUCATION.

In the Carnival of 1911 the Bureau of Education demonstrated to the public by means of a comprehensive exhibition of industrial work from all grades of the public schools that industrial education is firmly established on a practical basis, and judging from the eulogistic expressions of satisfaction that have been heard on all sides, and the still more potent evidence of nearly ₱9,000 of the public's good money that was eagerly exchanged for the products of the schools, there is no reason to doubt that the public has set the seal of its unqualified approval on the present system of education that is making the product of the schools self-supporting and self-respecting citizens. Practically every province of the Archipelago was represented with all grades of work from the little lamp mat of buri weave by the first grader to the filing case of nara or other precious wood beautifully made and finished by the seventh grader in a trade school.

Approximately 15,000 articles were exhibited, an average of about 400 finished and selected articles from each province, the total value of which exceeded ₱10,000. This represents but a small fraction of the industrial work being accomplished in the schools of the Archipelago, as only a few of the choicest articles were selected from each school and province for the Carnival exhibition.

This exhibition demonstrated the great possibilities of the Islands in the way of materials for home industries, and the

courses being given in the schools under the direction of the Bureau of Education are designed to make full use of the latent resources of the Islands by developing such minor industries as will serve to occupy the idle time of a people essentially agricultural, the development of which will add materially to the wealth of the country and contribute largely to the well-being of its inhabitants.

One of the features of the past Carnival from which much good is expected was the attendance at the exhibition of some of the leading workers in the industrial schools of the Islands, male and female, American and Filipino, all of whom will take back to their respective provinces a fund of information obtained from daily contact with the public and from the actual handling of the exhibits, which knowledge should be of inestimable value when properly disseminated by the 8,000 teachers upon whom fall the daily task of directing the industrial work of the schools.

A series of industrial conferences were held during the Carnival at the general office of the Bureau of Education. A copy of the program follows for the information of those who are interested in knowing the different problems that are being worked out by the Bureau of Education.

PROGRAM FOR CONFERENCES OF INDUSTRIAL TEACHERS ACCOMPANYING THE 1911 CARNIVAL EXHIBITS.

These conferences were held under the direction of Mr. C. H. Magee, Second Assistant Director, from 10 to 12 a. m. on February 23, 24, 25, 27, and 28, 1911.

February 23.

1. "Establishment of primary woodworking shops and the effect on trade and manual training schools." Alma Beck.
2. "The limits of cabinetmaking and the teaching of building trades in the trade schools." Bruce Ingersoll.
3. "The correlation of mechanical drawing and shop work." George Hofstetter.
4. "Bamboo and rattan work and its limits in industrial instruction." R. B. Robinson.

February 24.

5. "Relation between primary and intermediate industrial work." Kilmer O. Moe.
6. "School gardening." Lewis S. Thomas.
7. "Philippine preserves, jams, and jellies." Miss V. M. Wakeman.
8. "Housekeeping and household arts." Miss Bessie Taylor.

February 25.

9. "How to secure a local and foreign trade for industrial school products." G. G. Lyman.
10. "A system of accounting for primary industrial school work." L. R. Sawyer.
11. "Exhibition work." John H. Finnegan.
12. "Preparation of teachers for primary industrial work." U. S. Andes.

February 27.

13. "Mat weaving." John F. Minier.
14. "Limits of primary industrial work." Mrs. Carrie N. Anderson.
15. "Practical results of primary industrial work." Joseph Loughran.
16. "Household and minor industries of Japan." Austin Craig.

BUREAU OF PRINTING.

Printing, ranking seventh among the world's greatest industries, has become the most important factor in developing organizations and movements and the means of conducting the affairs of the world. This art and craft has a supreme influence upon every line of business and has been the true agency in the rapid advancement of science and mechanics. Though it is a fact of universal knowledge that printing enters into the most minute affairs of the world, the true significance of the progress being made is by no means fully appreciated.

In a unique display by the Bureau of Printing, the actual production of printing and binding by old and new methods constituted an interesting exhibit and gave an idea of the progress being made. A latest model typesetting machine was operated alongside of an employee setting type by hand, demonstrating the wonderful strides made within the last few years in the printing trade. Printing sheets at about 1,200 an hour on a hand-feed platen printing press compared with an automatic-feed printing press delivering 12,000 printed sheets an hour was an interesting operation. The old method of sewing books by hand and the new method of sewing by machinery attracted considerable attention. A modern flat-bed cylinder press was operated. A daily paper called "The Carnival Spirit" was printed on this press.

Besides demonstrating the old and new methods of operations in typesetting, presswork, and bookbinding, employees of the Bureau were executing all the specialties of book finishing, photo-engraving finishing, and electrotpe finishing. Half-tones, electrotypes, and stereotypes were shown in various stages. There was a large display of finished products of the

bookbinders, from pamphlets to full russia leather with extra hubs. Two books were on exhibition which were probably the finest specimens of bookbinding in this part of the world. The bindings were full levant morocco, beautifully hand tooled, and with the edges illustrated.

Special mention should be made of the first public demonstration in the Philippine Islands of the art of marbling. The Bureau only recently added this specialty, and the demonstrations by Filipinos who were taught by an American craftsman instructor attracted more people and held their attention longer than any other demonstration. The crowds marveled at the designs produced considering the manner of throwing the colors.

The Bureau of Printing exhibit presented an excellent idea of what has been accomplished by the proper instruction and supervision of Filipinos in the numerous specialties which enter into the production of a book. The work of the Bureau is done almost wholly by Filipinos under supervision of American craftsmen instructors.

BUREAU OF PUBLIC WORKS.

The Bureau of Public Works exhibit was displayed in a separate building in the form of an open square. This exhibit, which consisted principally of models, charts, maps, photographs, drawings, etc., was remarkably interesting and instructive not only that it showed the progress made with all kinds of public works from the organization of that Bureau up to the present time, but in the consequent greater possibilities for the progress and improvement of health, agriculture, commerce and education. The exhibits were arranged in six divisions: First, surface road construction; second, road maintenance; third, bridges and culverts; fourth, irrigation; fifth, artesian wells; and sixth, special projects.

The kind of surfaced roads being constructed in the Philippines was shown by a model which not only showed the character of the roads constructed, but the three different types of standard bridges used throughout the Islands.

A chart showed the annual increase in the equipment of the Bureau for constructing surfaced roads from 1907 to 1910, as follows: 1907, 5 rock crushers valued at ₱9,400 and 8 road-rollers valued at ₱37,800; 1908, 6 rock crushers valued at ₱14,900, 12 road rollers valued at ₱62,700, and 10 kilometers of tramway valued at ₱20,000; 1909, 17 rock crushers valued at ₱55,000, 31 road rollers valued at ₱177,200, and 60 kilometers of tramway valued at ₱130,000; 1910, 18 rock crushers valued at

₱57,500, 43 road rollers valued at ₱243,200, and 80 kilometers of tramway valued at ₱170,000, which for the present year has been increased to 112 kilometers valued at ₱241,000. The value and importance of this large equipment for the construction of public roads and bridges can not be overestimated.

The progress in surfaced road construction during the past four years was shown by a chart showing the number of kilometers of road constructed and the comparative amount of produce hauled over these roads annually. This chart showed that on June 30, 1907, when the present road policy was inaugurated there were 600 kilometers of surfaced road a large part of which has since been rebuilt. In 1908, this was increased to 796 kilometers; in 1909 to 1,093 kilometers, and in 1910 to 1,344 kilometers. There has been a material increase in the average load hauled. In several cases the load has been doubled or trebled and the average haul quadrupled.

The work of road maintenance in all provinces was illustrated by a chart showing the number of camineros (road men), the number of kilometers cared for, and the amount of money expended each year. This chart showed that in the calendar year 1908, 517 camineros were employed, who cared for 265 kilometers of road at an expenditure of ₱120,000; in 1909 the number of camineros was increased to 1,330, the number of kilometers of road cared for to 742, and the expenditure to ₱390,000; while in 1910 there were 1,966 camineros, 1,252 kilometers of road cared for, and an expenditure of ₱750,000. There are 156 roads under the caminero system, 81 roads maintained by trained gangs, and 60 roads by trained gangs who are employed for a few weeks at a time, the intermittent gang system.

In connection with the work of road construction and road maintenance the bureau had on exhibit a most interesting road map of central Luzon, showing the roads actually constructed and those projected for connecting Manila with the adjoining provinces. The road system determined upon aims at opening to automobile traffic from Manila the provincial road systems of the adjacent Provinces of Rizal, La Laguna, Batangas, Cavite, and Bulacan, ultimately extending them to the north into Pangasinan, La Union, and the Ilocos Provinces, to the east into Tayabas, and to the west into Cavite. This map shows the completed surfaced roads, proposed surfaced roads, alternate routes, railroads, and proposed railroad lines. There are three main roads connecting the capital with the provinces, namely, the North Road, the East Road, and the West Road. The North Road has been com-

pleted as far as Malolos and San Ildefonso in Bulacan. The Bureau plans to complete this road during the year so that it will be possible to make the automobile trip from Manila to Sibul Springs in about three hours. The present plans call for the extension of the North Road to Pangasinan Province and north along the coast of La Union and the Ilocos Provinces. The East Road is intended to connect Manila with Atimonan on the Pacific Ocean. Two or three links of this road have not been constructed, but the funds available amount to nearly ₱400,000, which should practically complete the work. The West Road, which is intended to connect Manila with the town of Cavite and the other towns of Cavite Province beyond, is a costly piece of work, but progress is being made; the current appropriation for this work amounts to about ₱50,000.

Irrigation has for years been recognized by the Government as one of the essentials in eliminating the heavy drain on the resources of the Islands through the purchase of rice abroad. During the Spanish administration many dams, tunnels, viaducts, and distributing systems were constructed, which are scattered throughout the best agricultural portions of a number of provinces. The work of this division has been confined mainly to the maintenance of existing works, to one large construction, to securing topographical and water data, and to design. The funds available for this work at the beginning of the present fiscal year amounted to ₱2,250,000 in addition to the regular annual appropriation of ₱750,000. Approximately all of the preliminary work has been completed on eight projects in five different provinces. These projects will irrigate over 60,000 hectares (150,000 acres) of land. Preliminary work has been begun on projects aggregating an additional 350,000 hectares (857,000 acres). The projects under consideration contemplate the bringing of nearly the entire central valley of Luzon, from Dagupan to Manila, under irrigation.

Representing the division of artesian wells was a model well-drilling outfit; a case with a glass front showed how water collects beneath the earth's surface and how it is brought to the surface and made available by pumps and flowing wells. The work of this division was illustrated by many photographs of wells which have been drilled in different provinces. A chart showed the progress of this work from 1905 to June 30, 1910. In December, 1910, the Bureau had drilled over 400 wells; it owned thirty-six well rigs which were working and completing one well every day. This work aims at improving the quality of the drinking water in the lowland municipalities.

There were photographs, charts, wash drawings, colored plates, or models representing the special projects under the Bureau's supervision, including the public automobile service, the Cebu custom-house, Osmeña waterworks, the Philippine General Hospital, improvements in the city of Baguio, and the Insular Normal School.

The organization and development of the work of the Bureau was well illustrated by a chart showing approximately a twenty-fold increase in the work actually undertaken and carried on between January 8, 1903, and December 31, 1910. This chart showed that in 1904 there were 30 engineers, 2,000 laborers and an expenditure of ₱150,000, while in 1910 there were 110 engineers and 20,000 laborers maintaining 2,350 kilometers of road, constructing 250 kilometers of road and 300 bridges and culverts yearly, operating 36 well-boring rigs, supervising irrigation construction, transportation lines, and Insular, provincial and municipal building work, requiring a total expenditure of ₱8,000,000.

MONTHLY VETERINARY REPORTS—FEBRUARY AND MARCH.

RINDERPEST.

During the past four weeks there have been numerous changes in the rinderpest situation in the Philippine Islands. While there are as many towns infected as there were last month, the chief centers of infection have been confined to Central Luzon.

Cagayan and Isabela.—A month ago there were two municipalities in the Province of Cagayan and two in the Province of Isabela infected with rinderpest. At the present time there is but one infected municipality in each of the above-mentioned provinces.

Pampanga and Bulacan.—The situation in these provinces remains practically the same as it was last month. There are now five infected municipalities in the Province of Bulacan and seven in the Province of Pampanga.

Nueva Ecija.—This province contained three infected municipalities at the time of the last report. There are no known cases of rinderpest there at present.

Tarlac.—In this province the infection is known to be present in six municipalities. While this number of municipalities is infected, there are very few cases, and the losses have been comparatively small.

Pangasinan.—This province presents by far the most serious situation at present, and there are found approximately fifty new cases each week. There is a large force of employees at work in this province, and the provincial officials are taking a great deal of interest in the eradication of the disease. On account of the quarantine which it has been necessary to impose, traffic has been somewhat checked, but to prevent the quarantines from causing any material losses to the residents of the province, the Government has sent several automobiles which are to be used in the transportation of goods from one municipality to another. A large territory being infected, it will be impossible to quickly eradicate the disease, but the effect of the

quarantines which have recently restricted the movement of animals should soon cause an improvement in the situation.

Benguet.—Before the quarantine system could be properly adjusted animals from Pangasinan evidently carried the infection into the Provinces of La Union, Nueva Vizcaya, and the subprovince of Benguet. Such stringent measures were adopted in the latter that it is believed that no further cases will occur. There have been no cases of rinderpest in Benguet since the week ending March 4, 1911.

La Union.—In this province there have been five cases and two deaths in the municipality of Agoo. The remaining municipalities of that province have been carefully inspected and no others centers of infection have been found. Several employees of this bureau are now at work in the southern part of the Province of La Union, and it is expected that the disease will soon be eradicated from the infected municipality.

Nueva Vizcaya.—In this province six cases of rinderpest have recently been found in the municipality of Bambang. The remainder of the province is supposedly free from disease.

From the above summary it may appear that little has been accomplished in the eradication of rinderpest during the last month, and while it is true that the number of infected municipalities in Central Luzon has recently increased, it is equally true that great gains have been made in the southern Islands. Two veterinarians have been carefully inspecting the Island of Panay for several weeks without finding any trace of rinderpest. It is believed that with the eradication of disease from the municipality of Miagao the last trace of rinderpest was eradicated from Panay.

Occidental Negros.—This province has remained free from disease, but one veterinarian has been constantly at work to make sure that no trace of infection remained from the serious outbreak which this province recently sustained.

Oriental Negros.—A month ago there were nine infected municipalities in this province. From present indications it seems that rinderpest will soon be eradicated from the island. The disease has already been eradicated from several municipalities which were infected a month ago, and at the present time actual cases of rinderpest are found in only three municipalities.

Cebu.—This island has two infected municipalities, but there are only two cases of rinderpest in the province.

Bohol.—This island has one infected barrio in the municipality of Talibon.

Leyte.—In this island the municipalities of Tanauan and Tolosa are infected. There has been only one case of rinderpest in the municipality of Tanauan for some time.

Surigao.—In this province two municipalities are considered infected, but there has been no rinderpest in one of these municipalities for nearly a month.

Moro.—As stated in a previous number of this publication, the Davao district of Mindanao has suffered from a severe epizootic. The great losses which were sustained during the months of November and December, 1910, were quickly alleviated by the application of the most extreme measures ever adopted anywhere in the Philippine Islands, and in two months the disease was practically eradicated. The great success in the rapid extermination of the disease from that district was made possible by the thorough coöperation of the officials of the Moro Province. At first, steps were taken to ascertain the extent of the infection, and as soon as this was determined the quarantine line was drawn around the whole infected area, absolutely prohibiting all animals susceptible to this disease from leaving the infected district. Then, after the surrounding country had been protected, the work of eradicating the disease in the infected localities was begun. The first point taken up was the disposition of the sick animals. These were immediately slaughtered. Then came the problem of the proper disposal of those animals which had been exposed but which had shown no symptoms of disease. These exposed animals were also slaughtered. Then the disinfection of the stables and corrals and the quarantine of fields where sick animals had been was practically all that remained to be done.

MONTHLY CROP REPORTS—FEBRUARY AND MARCH.

ABACÁ.

Ambos Camarines.—The price of abacá continues to go down and rice has advanced from ₱6.80 to as high as ₱8 in Paracale and Mambulao.

Bohol.—The price of abacá in Cebu has dropped during the month and on this account very little is harvested.

Mindoro.—Abacá is now bringing better prices and larger quantities are being stripped than formerly. Mindoro abacá, when carefully cleaned, brings prices which makes the industry a profitable one.

Sorsogon.—The price of abacá still remains the same as last month for poor grades, but the people will not clean good grades of fiber and are continually complaining about the poor prices that are being paid.

COCONUTS.

Mindoro.—A great many coconuts are now being planted in this province.

Zambales.—Persons looking for profitable investments should not overlook Zambales coconut lands. These lands, practically level and sufficiently open for planting, near seaports, can be had at from ₱25 to ₱40 per hectare. Large areas are now being planted. In Candelaria all coconuts not used for local consumption are planted. In San Marcelino the hill lands are being planted to coconuts, an experiment that will be watched with much interest.

CORN.

Cagayan.—Corn was badly damaged by the drought and a very poor yield is the result.

Capiz.—More corn is being planted this year in this province, and especially in the northern part than was planted last year. The damage done to last year's rice crop by the typhoon in November is given as the cause for this increased planting of corn.

Cebu.—The corn crop already harvested did not meet expectations and the growing crop is not expected to materialize to any

extent by reason of a lack of rain. The outlook as regards food for the poorer classes is anything but promising.

The present crop of corn will not be sufficient to supply the demand. This grain is now being sold at exorbitant prices. Those who can afford to do so are holding in store such quantities of corn as they are able to purchase in anticipation of more excessive rates.

Ilocos Sur.—Corn is now being harvested in the subprovince of Abra and a fair crop is reported.

Iloilo.—The municipalities of Santa Barbara, Pototan, and Passi are planting large tracts of land to corn.

Passi appears to have better looking corn and more of it than any other municipality in the central part of the province.

Nueva Vizcaya.—The area planted to corn during 1910 in the municipality of Bayombong was 117 hectares, there being no increase over that planted during 1909.

Oriental Negros.—Corn is the main crop in the southern part of this province and was being harvested during the latter part of January. The returns from this crop are very fair and no complaints are being made.

GUINEA GRASS.

Ilocos Sur.—The guinea grass that has been planted in Vigan is doing well. About 75 per cent of the plants are alive. The guinea grass at Bangued is also growing well.

KAPOK.

Oriental Negros.—Machinery for cleaning and pressing kapok has been installed in Dumaguete. There are about 100,000 kilos of crude kapok produced in Oriental Negros each year. This represents about 33,000 kilos of the cleaned article, as it is generally understood that 3 kilos of the crude kapok will produce 1 kilo of the cleaned first-grade article. The season begins about the 1st of April and continues until about the 1st of September.

RICE.

Albay.—The harvesting of the rice crop has continued well on into the month of February, the yield being about normal.

Ambos Camarines.—The present indications are that the rice crop in Camarines Norte will be the largest in many years. Nearly all of the rice land has been planted in that part of the province and the crop is now beginning to head out. The heavy rains of February were very favorable for the rice crop. The people in Camarines Norte are very hopeful and enthusiastic

over their prospects. Rice harvesting in the lower Bicol Valley regions is now nearly over and the crop has been a very poor one, due to a combination of unfavorable conditions. The rice crop suffered more than usual in this section from rats, birds, and insects, and it is estimated that from 50 per cent to 75 per cent of a normal crop will be obtained.

Antique.—It is almost impossible to purchase either palay or rice in Pandan or Culasi. The people are holding what little they have to supply, in so far as it will, their own needs. A second crop has been planted in some sections of Pandan. Camotes, corn, and mongo crops will probably be sufficient to prevent much want until the next regular palay crop is available.

Bohol.—The people in some of the towns, especially in Calape, are in a bad financial condition, as the last rice crop was mostly destroyed by rain and floods and the market price of rice has increased considerably. They expect to have a good crop in April and May.

Iloilo.—The rice crop has been harvested and is from 25 per cent to 50 per cent short all over the province.

In the municipalities of Santa Barbara, Jaro, and Pototan some of the rice planters are beginning to plant mongos in the rice fields after the rice has been harvested.

Isabela.—Rice is selling for ₱8 per sack in the local market in Echague and is very scarce. In Ilagan second-class rice is selling for ₱7 per sack and first-class for ₱9 per sack. There is plenty of rice on hand in the local market in Ilagan.

Mindoro.—A big crop of rice will be planted in April.

Nueva Vizcaya.—In the municipality of Dupax the bulk of the palay crop was harvested in January. The area planted to palay in 1909 was 859 hectares and in 1910, 965 hectares, showing an increase of 106 hectares. The palay is of good quality, and the crop of 1910 shows an increase of 10 per cent over that of 1909. In Bayombong the area planted to palay in 1909 was 701 hectares and in 1910, 983 hectares, showing an increase of 282 hectares. The crop for 1910 showed an increase of 20 per cent over that for 1909. In Solano the palay is of good quality, but the crop for 1910 showed little increase over that of 1909. The area planted to palay in 1909 was 1712 hectares and for 1910, 1715 hectares, an increase of 3 hectares. In Bagabag a decrease of 20 per cent is noted in the palay crop. The area planted in 1909 was 772 hectares and in 1910, 480 hectares, a decrease of 292 hectares. This large decrease is due to lack of water for irrigation and lack of work animals.

Oriental Negros.—Recent reports from the southern part of

the province indicate that the rice crop is yielding about three-fifths of the usual harvest.

Sorsogon.—Rice planting has been going on during the month of January and weather conditions have been very favorable. In the vicinity of Bacon, Gubat, and Sorsogon 100 per cent more rice has been planted than at the same date last year.

Surigao.—The rice crop this year will be a failure on account of drought, but no actual lack of food is expected on that account, as the people here have planted a great deal of corn, camotes, and other crops. Nearly all of the farmers have either abacá or coconuts, so that in case of the failure of the rice crop they can always strip abacá and buy the necessary rice. This, however, means more work and a little less money for luxuries.

Zambales.—About 300,000 cavans of unhulled rice will be shipped out of this province this year. The present crop is considerably above the average. The municipality of San Narciso leads with a crop of 25 per cent better than last year. As against this increase in crop 5 per cent more land was cultivated. Candelaria will double the amount shipped out last year but has increased the acreage by 30 per cent. All municipalities, excepting Iba and Palanig, report an increase over last year. The lowland rice grown is a small, flinty, bearded variety, easily hulled but not very prolific.

In the municipalities of San Narciso, San Marcelino, San Antonio, and Castillejos there is a communal irrigation system, completed in 1872, by which 50 square miles of rice land can be irrigated. This system formerly funished water to these towns at all seasons of the year. It is at present, however, badly in need of repair. The landlords insist that the tenants should keep it in repair, while the tenants claim that the expense should be borne proportionately. The provincial board now has the matter under consideration. If the system were repaired, the four towns above mentioned could easily produce more rice than is now grown in the entire province.

SUGAR CANE.

Antique.—Sugar cane was being harvested during the month of January and a good crop is reported. Lack of transportation has prevented any shipment of sugar.

Cebu.—The last crop of sugar harvested was only a fair one. The *hacenderos* are holding this in anticipation of a better price than that which is now offered.

Ilocos Sur.—The people in this province are now harvesting

their sugar cane. The crop is above the average, but the price is low.

Iloilo.—The yield of sugar is very satisfactory this year, and most of the sugar planters are making efforts to double their crop for next year. Several new sugar plantations have been recently started.

Along the Philippine Railway more land is being prepared and planted to sugar cane this year than last. Between the municipalities of Panitan and Pontevedra there is a large tract of new land being planted to sugar, while further north on the coast of Pontevedra Bay there are three large sugar *haciendas* which will have as much land under cultivation this year as they will be able to plant and cultivate.

La Laguna.—The farmers of Calamba, Santa Rosa, and Biñan are busy milling cane. They will plant almost double the area of last year. Planting is now in progress. Large areas which have remained uncultivated for many years are now being plowed and planted.

Oriental Negros.—Sugar cane was being harvested in this province during the month of January, and the sugar planters are very well satisfied. There has been some complaint about the difficulty of harvesting on account of the rigid quarantine now existing. The planters have found, however, that horses and men can be used to good advantage in this work, and while it is slightly more expensive the work appears to go on just as rapidly.

TOBACCO.

Cagayan.—Growing tobacco, although somewhat damaged by the extremely dry weather of January, is looking fairly well and a fair yield is expected.

Capiz.—Considerable tobacco is being raised all along the coast of Capiz Province, especially in the municipalities of Calibo and Ibajay. The tobacco is growing nicely but will be of inferior grade, as it is raised too near the sea.

Ilocos Sur.—More tobacco has been planted in the subprovince of Abra than for a number of years past, and it is reported to be growing nicely.

Iloilo.—There is much more land under tobacco cultivation this year than either last year or the year before. At the present time the tobacco crop has not been damaged in any way and appears to be in first-class condition.

Isabela.—Practically all of the tobacco in the municipalities north of Cauayan has been sold and is now being shipped out

of the province. The average price per fardo this year is about ₱3.75, which is about ₱2 less than the price paid last year for the same product. Up to the present writing very little tobacco has been sold in the municipalities of Cauayan, Echague, Tagle, and Santiago. All of the farmers in this section are holding off for better prices, but it is believed that they will yield to the buyers' rates during the month of February. Nearly all of the farmers in the towns of Echague, Tagle, Santiago, and Cauayan have completed the planting of this year's crop, as this section has been favored with more rain than the northern part of the province. On account of the dry weather which prevailed in the municipalities of Naguilian, Gamu, Ilagan, Tumauini, Caba-gan Nuevo, San Pablo, and Santa Maria during the month of January, only about one-half of the tobacco crop has been planted in this territory.

NOTES FROM OTHER FIELDS.

RUBBER AND CACAO.

Under the above caption, the *Tropical Agriculturist*, Volume XXXVI, No. 1, gives timely warning of the danger that may result from interplanting rubber and cacao. It is stated that in some districts of Ceylon, in West Africa, and in other countries the combination has been very successful, but the situation has been entirely changed since the discovery by Mr. Petch that the canker which has long been known to be so injurious to cacao sometimes does great damage to the rubber tree. Where these two cultivations are carried on together, and more especially where they are intermixed, the result will in general be that there will be much more canker on the rubber than in places where there is no cacao. Not only does the presence of the cacao increase the actual amount of the canker fungus in the plantation, but its presence also makes the shade greater and the air damper, both of which conditions tend to the more rapid spread of the disease.

Consequently it is evident that where cacao canker is universally distributed, as in Ceylon, rubber and cacao should not be intermixed in places where they are not already grown together. On estates where they are already intermingled, if the canker can be kept down by prompt and efficient measures, the two crops may be left; but where this can not be done and the canker increases on the rubber, where it does more harm than on the cacao, either one crop or the other should be sacrificed, in order to prevent the loss that might be caused to neighboring estates by the spread of the disease.

SUGAR CONDITIONS IN THE BRITISH EAST INDIES.

The *Louisiana Planter* for January (Vol. XLVI, No. 1) gives some interesting information with regard to the growth of sugar cane in the British East Indies. It is stated that the cane is a perennial, robust grass, with a stem reaching from 16 to 32 feet in height. This stem is cylindrical, solid, and ends in a slender, hollow tip which bears the flower. The roots, which are fibrous and wide spreading, either spread near the

surface, or if planted in loose soil, will strike straight down to a great depth.

There are various qualities and varieties of cane, some thick stemmed and others thin, some soft skinned and others hard, some drought resisting and others needing a large amount of water. One variety known as "Khari" is considered exceptionally good, as it withstands drought and water logging well, resists the attacks of animals, insects, and fungus pests, is prolific and produces a good quality of gur, the indigenous name for *masse cuite*. In India it is noticeable that the land is extensively cultivated, often being plowed eight or ten times and harrowed four or five times. To force the canes ahead, irrigation is resorted to, and fertilizers, largely of domestic production, are used to a considerable extent.

ANTISEPTIC TREATMENT FOR HEVEA IN INDO-CHINA.

With regard to the introduction of the Hevea plant into Indo-China we quote from the Tropical Agriculturist (Vol. XXXVI, No. 1) the following order issued by the governor-general:

The introduction of the Hevea plant into Indo-China is forbidden. The fruits and seeds of the Hevea imported must be as soon as landed, and before being otherwise handled, treated by an antiseptic solution, according to instructions attached to the decree. The operation shall be carried out at the expense of the consignee, who should notify the expected arrival of such goods several days in advance, so as to obviate delay. In case of contravention of this decree—i. e., introduction of untreated seed—the respective parcels will be seized and destroyed, without prejudice to further penal proceedings. The antiseptic treatment is to consist of placing the seeds in a large meshed basket, to be plunged into an antiseptic solution for half an hour and agitated several times, then washed in three or four waters and laid out in the usual way. The solutions are to consist of 1 to 1,000 bichloride of mercury or of 1 to 100 sulphate of copper minimum. In the latter case the government may increase the strength.

NOTES ON BANANA CULTIVATION.

In the Queensland Agricultural Journal for January (Vol. XXVI, No. 1) Mr. C. Ross, instructor in fruit culture, gives the following suggestions for successful banana culture:

An ideal banana soil should be plentifully supplied with humus and natural plant food and contain an abundance of moisture. At the same time the drainage must be perfect; a too retentive subsoil should be avoided or artificially drained.

Plants required for a new plantation should never be taken from old worn-out stools. The best and cheapest plants which give the best results are suckers or bulbs separated from the strongest and most vigorous plants that are producing the largest bunches of the finest fruit. The worst possible system is that of continually planting suckers taken indiscriminately

and without careful selection, and this is the most serious of all causes of deterioration in size, quantity, and quality of the crop.

The first essential is thorough preparation of the soil, supplemented with a generous supply of plant food. Nitrogen is needed for the production of stout stems and large leaves. For the production of fruit the most important constituent of the soil is potash, and if this be deficient it must be abundantly supplied.

Localities subject to strong winds are not desirable, as the large delicate leaves when blown into ribbons cause a check to the vitality necessary for producing large bunches.

No intermediate crop should be allowed to grow in the plantation even when young. Weeds and trash should not be removed from the ground, but used as mulch around the plants, and when this mulch is rotted it may be incorporated with the soil, where it will help to retain moisture and maintain the soil in a porous condition; this failing no amount of artificial fertilizers will be of much service.

In the north, where some attention is being paid to rubber growing, the idea is to plant rubber trees between the rows of bananas, so that the latter before being removed will more than pay the expense of establishing a rubber plantation. In such a case the bananas become the subsidiary crop and the rubber the permanent crop. Neither crop will do the other any injury as regards the exhaustion of plant food. The rubber tree roots deeply and draws most of its nourishment from a depth, and by the time it has sent forth its surface roots the bananas will be ready for removal.

THE SUGAR INDUSTRY IN QUEENSLAND.

According to the Australian correspondence of the Louisiana Planter (Vol. XLVI, No. 3) the sugar season for 1910 has been a very successful one for Australia. Preliminary figures based on the actual crushing and the amount of cane still in sight estimate an output of 207,300 tons from the State of Queensland, which is 33 per cent more than the actual figures in 1909. The area planted is approximately 100,000 acres (40,470 hectares), an increase of 20,000 acres (8,094 hectares) over 1909.

There has been an increased interest in the sugar industry, due partly to the substantial bounties offered and partly to the appointment of a commission which is to report on the question of government assistance toward the erection of central mills. About fifteen years ago the government advanced money to build a number of mills, but they made poor progress toward paying off their indebtedness until Dr. Walter Maxwell took the matter in hand and put the mills on their feet. Several of them were able to pay off their indebtedness and others are now on the way to doing so. The general unsatisfactory position of the mills for the time being created a feeling in the minds of those in authority against any further advances for new mills. But the demands have been so insistent from quite a number of localities, and the prospects for sugar growing are so good,

that it has been borne home to the ministers that unless Queensland moves in the matter other parts of the Commonwealth will do so; it has, therefore, been decided to erect several other mills in localities which the commission will select. The consumption of sugar is growing so rapidly that it will require a number of these mills to overtake it, seeing that it will be at least five years before they can get into full profit. In addition, a number of private mills are under way in various parts of the State, so that in the course of a year or two there should be little room for imported sugar, especially if the industry is started in the northern territory, which is in a tropical belt not yet properly opened up.

The article goes on to state that the shortage of labor which has been felt for some time is likely to increase. The State government is planning the construction of nearly 2,000 miles of railway, and this will involve the employment of a large number of men who might, under ordinary conditions, find work in the cane fields. It is thought that it will be necessary to secure labor from abroad or the sugar industry will suffer severely. However, it is hoped that this railway will open up large areas of land suitable for sugar cultivation and greatly increase the sugar industry.

MARKET REPORTS.

NOTES ON MANILA MARKETS FOR FEBRUARY.

By KER & Co.

(Based on advices from New York, January 23; San Francisco, January 28; London, February 2; Iloilo, February 21; Hongkong, February 25; Cebu, February 25).

SUGAR.

Iloilo.—Market has advanced smartly and closes firm at ₱7 per picul No. 1, ₱6.50 No. 2, and ₱5.50 No. 3. Crop is now estimated at 118,125 tons.

Manila.—Quoted at an advance of 50 cents per picul, say, ₱6.25 No. 1, ₱5.75 No. 2, and ₱5 No. 3.

Cebu.—Little doing. Quotations: ₱5.50, ₱5, and ₱4.50 per picul for Nos. 1 to 3.

HEMP.

Market has improved and we quote fair current for Europe ₱7.75 and for America ₱8.25 per picul f. o. b.

COPRA.

Closes steady at the reduced prices of ₱9.50 per picul Manila fair merchantable, and ₱10 per picul Cebu fair merchantable f. o. b.

DISTRIBUTION OF PRINCIPAL PHILIPPINE EXPORTS FOR THE TWO MONTHS, JANUARY TO FEBRUARY, 1911.

Products exported.	United States.	China	Pacific coast.	Great Britain.	Continent of Europe.	Australia.	Japan.	Malay States and India.
Dry sugar (tons) -----		8,058						
Hemp (bales) -----	90,527	1,800	7,929	66,668	11,356	3,254	3,440	1,775
Copra (piculs) -----			14,400	5,600	151,554			
Cigars (thousands) ----	788	4,794	1,786	2,014	1,623	858	127	2,366

MANILA AND LONDON FIBER MARKET.

Manila hemp receipts and shipments.

(Telegram from Manila to London, March 13, 1911.)

	1911	1910
Hemp receipts at:	<i>Bales.</i>	<i>Bales.</i>
Manila since January 1	194, 866	180, 529
Cebu, etc., since January 31	67, 684	54, 859
All ports since January 1	262, 550	235, 388
Shipments by steamer to:		
United Kingdom, cleared since January 1	108, 789	46, 143
Atlantic coast, United States, cleared since January 1	85, 102	93, 024
Pacific coast, United States, cleared since January 1	29, 007	14, 987
Continental ports, cleared since January 1	20, 514	7, 873
Shipments to:		
All other ports	13, 434	
Local consumption since January 1	2, 000	
	15, 434	11, 842
Loading steamer on the berth for the United Kingdom, about	2, 000	30, 000
Loading steamer on the berth for Atlantic Coast, United States, about		12, 000

Bales of hemp loading for United Kingdom, by steamer

Tean 2,000

Hemp arrivals at Manila during February, 1911.

Provinces	Piculs.	Bales
Albay	86, 958	18, 479
Sorsogon	16, 676	8, 338
Camarines	32, 672	16, 356
Leyte	15, 150	7, 575
Samar	18, 518	6, 799
Mindanao	8, 722	4, 361
Other districts	14, 800	7, 150
Cebu	6, 178	3, 089
Total	144, 174	72, 087

LONDON FIBER QUOTATIONS.

The following quotations on Manila hemp, sisal, and Philippine maguey are taken from the Weekly Market Report of Messrs. Landauer & Co., dated London, February 8, 1911.¹

MANILA HEMP.

	Spot and close by.	January to March.	March to May.
Best marks	42/- to 44/-	42/- to 43/-	42/- to 43/-
Good marks	40/- to 41/-	40/- to 41/-	40/- to 41/-
Good current	35/- to 36/-	35/- to 36/-	35/- to 35/6
25 per cent over current	22/6 to 23/-	21/- to 21/6	21/- to 21/6
Fair current	18/9 to 19/-	18/9 to 19/-	18/9 to 19/-
Superior seconds	18/6 to 18/9	18/3 to 18/6	18/3 to 18/6
Good seconds	18/6 to 18/9	18/- to 18/3	18/- to 18/3
Fair seconds	18/3 to 18/6	17/9 to 18/-	17/9 to 18/-
Good brown	18/3 to 18/6	17/6 to 17/9	17/6 to 17/9
Fair brown	18/- to 18/3	17/6 to 17/9	17/6 to 17/9
Manila hemp strings	14/- to 15/-	13/- to 13/3	12/6 to 13/-

¹ These quotations are in pounds and shillings English currency per ton. One pound equals about 10 pesos Philippine currency. One ton equals approximately 16 piculs.

Fine hemp has remained very firm and difficult to obtain. The few transactions that have taken place have been at full prices, and in some instances shippers have succeeded in obtaining an advance of 10 shillings to 15 shillings per ton.

Spot hemp is idle, fair current in dock selling at £18 5s. 5d. to £18 10s.

SISAL HEMP.

In New York the market is weaker, the price being 3½ cents, equal to £19 c. i. f. Europe. A small volume of business has been done on this basis and in superior quality at £20 10s. to £20 15s. c. i. f. continental ports.

MANILA MAGUEY.

Dull. Quotations are £16 10s. No. 1, £15 No. 2, and £14 No. 3 February. April shipment.

ILOILO SUGAR MARKET FOR FEBRUARY.

By FIGUERAS HERMANOS.

Arrivals of the crop from the sugar mills during the month of February amounted to 323,900 piculs. There was a gradual increase in price from 5 pesos and 4 reales¹ on the 1st of the month, for assorted sugar, to 6 pesos and one-half real on the 28th.

February shipments.

Date	Vessel.	Destination.	Superior.	Wet.
			<i>Piculs.</i>	<i>Piculs.</i>
Feb. 4	Sungkiang	Hongkong	13,926	
Feb. 7	Ningpo	Ningpo and Chinkiang	35,635	
Feb. 8	Taming	Cebu	2,231	
Total for February			51,192	

Exports up to March 5, 1911.

To—	1909-10 crop.		1910-11 crop.	
	Superior.	Wet.	Superior.	Wet.
	<i>Piculs.</i>	<i>Piculs.</i>	<i>Piculs.</i>	<i>Piculs.</i>
United States	18,400		33,600	
China	64,575		135,972	29.38
Total	82,975		169,572	29.38

¹ 1 real equals 12½ centavos.

PRINCIPAL PHILIPPINE IMPORTS AND EXPORTS— FEBRUARY, 1911.

By the **COLLECTOR OF CUSTOMS.**

IMPORTS.

Articles.		Manila.	Cebu.	Iloilo.	Totals.
Rice	/Kilos	4,431,941	1,333,126	1,870,952	7,636,019
	/Value	\$138,026	\$187,021	\$65,798	\$390,845
Beef cattle	/Number	2,742		122	2,864
	/Value	\$44,684		\$1,679	\$46,363
Eggs	/Dozen	276,382	13	83	276,428
	/Value	\$22,808	85	\$10	\$22,823
Sugar	/Kilos	215,280	16,424	53,040	284,744
	/Value	\$14,489	\$1,295	\$3,566	\$19,350
Coffee	/Kilos	15,531			15,531
	/Value	\$5,002			\$5,002
Cacao	/Kilos	49,276	28,111	140	77,527
	/Value	\$13,187	\$8,178	\$94	\$21,459
Raw cotton	/Kilos				
	/Value				

EXPORTS.

Hemp	/Kilos	5,212,576	2,041,404		7,253,980
	/Value	\$465,403	\$176,413		\$641,816
Copra	/Kilos	3,477,615	1,606,991		5,084,606
	/Value	\$293,820	\$170,868		\$464,688
Sugar	/Kilos	1,539,726			1,539,726
	/Value	\$60,474			\$60,474
Cigars	/Thousand	7,556			7,556
	/Value	\$106,999			\$106,999
Cigarettes	/Thousand	1,295			1,295
	/Value	\$1,044			\$1,044
Tobacco	/Kilos	1,136,617			1,136,617
	/Value	\$170,484			\$170,484

TEMPERATURE AND RAINFALL FOR AGRICULTURAL DISTRICTS IN THE PHILIPPINES.

By the DIRECTOR OF THE WEATHER BUREAU.

FEBRUARY, 1911.

[Temperature and total rainfall for twenty-four hours beginning at 6 a m each day.]

Date.	Hemp				Sugar, Iloilo.		Rice, Tarlac.		Tobacco			
	Albay.		Tacloban.		Temperature.	Rainfall.	Temperature.	Rainfall.	Aparri.		San Fernando.	
	Temperature.	Rainfall.	Temperature.	Rainfall.					Temperature.	Rainfall.	Temperature.	Rainfall.
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
1	26.9		26.5		26.8		27.4		25.8		27.1	
2	25.2		26.1		24.6		28.8		25.5	3.3	26.4	
3	27		26.5		25.6		28.2		23.4	72.3	25.2	
4	26.4	14	26.5	8	26.6		27.7	25.4	22.2	21.7	25.2	
5	26.9	1	27	4.6	26.4		26.3		23.2	4.7	26	
6	26	19.8	24.7	82.1	24.5	6	26.9		22.9		26	
7	26.4	2.5	24	67.1	24.1	18.9	26.4		21.7		26.2	
8	26.5		24.7		24.8		27.2		22.9	10.7	26.6	
9	26.9		24.8	22.1	25.1	5	27.1		23		24.8	
10	25.6	47.8	26.2	5	25.1	1.8	26.6		23.8	16.5	25	
11	25.6	19.6	25.8	26.2	26.1		26.4	3.8	23.6	18.5	24.7	1.5
12	24.8	25.4	24.7	46.4	25.9	19	25.8		24.1		26	
13	25.2	10.1	25.3	4.8	24.5		27		23.8		25.9	
14	25	12.2	24.6	8.1	24.5	16	26		23.7		24.8	
15	24.9	8.2	25.1	3.3	24.7	3	27		23.7		24.7	
16	25.2	16	25.8	.8	26		27.6		23.3	1.8	25.6	
17	26.1		26.3	.8	25.6	4.1	27		22.4	5.5	26	
18	25.5	65	25.8	.8	26.3	3	28		22.4	.3	26.2	
19	23.4	27.4	24.9	17	24.3	19	27.4		22.4	1.3	26.6	
20	23.5	58.2	24.4	27.9	24	1.5	26.4		21.4	9.1	25.2	
21	23.8	28.9	24.1		24.7		26.2		22.4		25.2	
22	24.7		23.1	1.3	25.8		26.4		21.6		25	
23	25.5		25.4	1	26.2		27		22.3	8.2	23.8	
24	25.5	.5	25.7		25.7		25.8		22.1	1.6	23.6	
25	24.8	16.8	26.1		26.8		26.2		23	7.8	24.2	
26	24	9.2	26.2		25.6		26.8		21.8	11.9	24.7	
27	25.3	.8	26.1	1.5	26.2		27.8		22.3		25.4	
28	25.7		27.2	2.5	27		26.5		22.8	1.4	25.7	

THE PHILIPPINE *Agricultural Review*

VOL. IV

MAY, 1911

No. 5

CONTENTS AND ILLUSTRATIONS.

CONTENTS.

	Page.
Editorial	225
A Declaration and Quarantine Order Regarding Rinderpest in Certain Provinces, by the Acting Secretary of Public Instruction	229
Address of Welcome Delivered at the Third Annual Meeting of the Philippine Vete- rinary Medical Association, by the Governor-General.....	230
Response by the Director of Agriculture.....	234
The Third Annual Meeting of the Philippine Veterinary Medical Association, Manila, February 25 to 27, 1911, by Dr. David C. Kretzer, Secretary-Treasurer.....	238
Report on the Recent Outbreak of Rinderpest in the District of Davao, Mindanao, by C. G. Thomson, D. V. M.	243
Statistics Regarding Rice and Hemp Growing in the Philippine Islands, by W. D. Hobart, Statistician	248
The Constitution and By-Laws of the Insular Agricultural Association of the Phil- ippine Islands	252
Monthly Veterinary Reports	260
Monthly Crop Reports	262
Current Notes: The Trinidad Garden; The Agricultural Bank; The Increase in Government Revenue; The Balance of Philippine Trade, Fruit Export for the Bureau of Agriculture	265
Notes from Other Fields: Modern Sugar Mills in China; Rubber Planters' Associa- tion in Cochín China; The Copra Trade in Ceylon for 1910; Sugar Matters in Cuba	269
Market Reports: Notes on Manila Markets, Manila and London Fiber Markets, Iloilo Sugar Market	272
Principal Philippine Imports and Exports, by the Insular Collector of Customs	275
Temperature and Rainfall, by the Director of the Weather Bureau.	276

ILLUSTRATIONS.

PLATE I. Map Showing the Development of the Rice-growing Industry in the Philippines	249
II. Map Showing the Development of the Hemp-growing Industry in the Philippines	251

EDITORIAL.

THE RINDERPEST SITUATION AND THE PEOPLE.

We are publishing in this number of the REVIEW five articles relating to the animal-disease problem in the Philippines. In no single number of the REVIEW previously issued has it been

possible to present so much material on this subject, and at no time during recent years has this question been of more vital importance to the people of these Islands than it is to-day.

With more adequate means at hand for fighting rinderpest than have ever before been available, an active campaign is now being waged against this disease both on Luzon and in the Visayan Islands. His Excellency the Governor-General, the Commanding General of the Philippines Division, and the officials of the Executive Bureau and the Bureau of Constabulary are extending to the Bureau of Agriculture all possible assistance in this work. A large force of Philippine Scouts and Constabulary has been detailed for quarantine service and a number of Army veterinarians and farriers are now assisting the veterinarians of the Bureau of Agriculture.

Provision has been made for the slaughter of infected animals and for the reimbursement of the owners of animals so slaughtered. Every effort is being made by the Chief Executive and by the officials of the Bureau of Agriculture to accomplish the desired result, which is the complete eradication of rinderpest, with as little inconvenience and loss as possible to the owners of live stock.

It may be well to note in this connection that the officials above-mentioned, the veterinarians, and the inspectors constitute but a small body of men, as compared with the thousands of cattle owners and the total population of the Islands. These men are but the leaders, the organizers, and the agents who are directing and carrying on the campaign. It is a self-evident fact that the live-stock owners, the farmers, and the people constitute by far the larger part of the equation in this problem. The campaign which is being carried on is primarily for their benefit, so naturally it may be expected that they will assist in every way possible in this work.

In the control and eradication of rinderpest and other animal diseases there is no more important factor than the support and coöperation of the people. It is their duty to learn the means of detecting disease in its first stages, to know what steps should be taken to save infected animals, and to guard against the spread of disease to other animals. It is only when the cattle owners and farmers understand these matters and coöperate intelligently with those who are directing this work that we can hope to rid the country from rinderpest.

The attention of our readers is invited to the address of His Excellency the Governor-General at the Third Annual Meeting of the Philippine Veterinary Medical Association, published in this number of the REVIEW. This address clearly outlines the

importance of the animal-disease problem to the Filipino people. Attention is also invited to the article by Dr. C. G. Thomson, which gives an outline of the work done in the district of Davao in the Moro Province. This report by Doctor Thomson is not only an account of an up-to-date and progressive campaign against rinderpest but is, also, a record of the coöperation and support of the officials and people of Davao in this work. Without such coöperation and support the results which were attained would have been impossible.

We can not too earnestly urge upon the people of these Islands that their hearty support be given to the small body of men who are directing the work of eradicating rinderpest. This support is absolutely essential if the best results and largest successes possible are to be attained. Every live-stock owner should not only take necessary precautions himself to guard the health of his domestic animals but should also disseminate among his neighbors information on this subject. With the united effort of the different forces that are now engaged in the campaign against rinderpest, aided by the support of the people, there can be but little question as to the successful issue of this campaign.

AGRICULTURAL DEVELOPMENT IN THE PHILIPPINES AND AGRICULTURAL ASSOCIATIONS.

One of the most important subjects discussed at the agricultural conferences held during the last Philippine Carnival was "The Necessity of Coöperation Among Philippine Farmers" and the closely related subject, "The Importance of Agricultural Associations for the Provinces."

Schools, public works, and other improvements have become so prominent as to bring the present methods of agricultural work in the Philippines into striking contrast. Conservatism is a typical characteristic of the farmer in every land, and no one can blame him for being conservative until he has been convinced that there are better ways and methods, better means and larger results to be obtained than those obtained by the means and methods which he has employed in time past. However, the time has arrived when the farmers should realize that they are the most important factor in the industrial and commercial development of the Islands.

That, "In unity there is strength," is a truth which needs to be emphasized. At present there is little unity, coöperation, or organization among the farmers in the Philippines. The good results possible from intelligent organization can

scarcely be overestimated. Organization offers to the farmers the opportunity for making their needs known to the Government, for protecting themselves against unjust practices, and for the best and largest development of their business. Until the farmers of the Islands become active and united, and begin to take an energetic part in abolishing bad practices and in working for laws which provide for the agricultural development of the country but little can be hoped for in the way of increased production and increased profits from the farms. In this number of the REVIEW we are publishing the constitution and by-laws of the Insular Agricultural Association, and from time to time suggestions and outlines of the work for associations in the provinces will be presented.

STATISTICAL MAPS ON PHILIPPINE CROPS.

We are publishing, on pages 249 and 251, reductions of statistical maps showing the production, by provinces, of rice and hemp in the Philippines. Six maps were prepared for the 1911 Carnival to show the localities where the six principal crops were grown in the Philippines during the fiscal year 1910, the darker shades showing the heavier growth. The other maps will be reproduced in subsequent issues of the REVIEW.

The province has been taken as the unit, it being impracticable to take municipalities of which there are, with townships and *rancherías*, upwards of 800. The reports furnished by municipalities form the basis of the material from which these maps were prepared. It will be noted that the fiscal year 1910 marked the beginning of the good results which have followed the passage of Act No. 1898, making it the duty of all municipal presidents to furnish quarterly reports upon crops and live stock. It is due to their work and the data furnished by them to the Bureau of Agriculture that the preparation of fairly correct maps has been possible. While the method of adopting a provincial unit does not give as exact information as would the using of smaller political divisions, it was thought that the general public would wish to know what provinces were the principal producers of any particular crop, regardless of their superficial area.

On the opposite pages from the maps the production and area under cultivation in each province is given. Any one wishing to go into the matter in greater detail can obtain from the Bureau of Agriculture the area planted and the production of any of the principal crops, by municipalities.

**A DECLARATION AND QUARANTINE ORDER REGARD-
ING RINDERPEST IN CERTAIN PROVINCES.**

BAGUIO, *March 21, 1911.*

In accordance with the provisions of section 5 of Act No. 1760, I hereby declare that the dangerous communicable animal disease rinderpest prevails in the Provinces of Cagayan, Isabela, Pangasinan, Tarlac, Nueva Ecija, Pampanga, and Bulacan, and that it is unlawful to remove animals susceptible to rinderpest, including cattle, carabaos, sheep, goats, swine, and deer, from any of the above-mentioned provinces without a certificate issued by authority of the Director of Agriculture.

W. CAMERON FORBES,
Acting Secretary of Public Instruction.

ADDRESS OF WELCOME DELIVERED AT THE THIRD ANNUAL MEETING OF THE PHILIPPINE VETERI- NARY MEDICAL ASSOCIATION.

By the GOVERNOR-GENERAL.

I am glad to take an opportunity to speak to the veterinarians in convention because I am so intensely interested in the result of their work. In my judgment there is no body of men in these Islands engaged in a work more necessary or vital to the progress of the Philippine Islands than is the work of the veterinarians of the Bureau of Agriculture to-day. The agricultural, industrial, and commercial existence of the country depends upon it. If you do not succeed in the work which you are now doing in suppressing animal disease in the Islands, especially rinderpest and surra, I can not see how the Philippine people are going to raise themselves from the agricultural depression from which they have suffered for the past ten years.

The value of the draft animal to the community can be calculated in three ways: First, the cash value of the animal, which runs into many millions of pesos but is really only incidental to the second value, which is his work in cultivation and transportation, and the third value is his value for beef purposes. The Philippine people are now importing their beef from foreign countries when they could perfectly well raise it.

The road work which is being carried on by the Department of Commerce and Police and the general improvement of transportation throughout the Islands, especially railroad construction, has had the effect of liberating the carabao from much of the transportation work for which he was used previously and enabling him to go to the fields. One carabao can haul much more over good roads than over bad, and can travel faster; and I have no hesitation in saying that the efficiency of the carabao for the purpose of transportation has increased from 400 to 1,000 per cent over what it was before this road campaign went into effect.

Elaborating a little on the importance of the draft animal from the point of view of meat supply, in this country of great heat and slow transportation meat will not keep more than a few hours and it is necessary for animals to be slaughtered where they are consumed and for the consumption to take place immediately. It is therefore imperative for the Philippine people to raise their own meat supply if the people outside of the great centers of population, where there are cold-storage facilities and imported animals are bought, are to have meat.

As an article of diet meat is also important from the point of view of improving the physique of the people, which in turn would enable them to work better.

While the risk of losing the capital invested, by reason of rinderpest or any other cattle disease, is an imminent one, and while the problem remains unsolved, we can not expect the people to invest their money in raising large quantities of cattle in the Philippine Islands. If you can have the cattle safely guarded and put in a pasture in which you can practically insure the owner of the cattle that it is not infected with contagion, or should the contagion appear, you are able to inform him immediately of the first case and that the thing can be prevented by the adoption of certain rules, that day we are going to have animals that instead of being slaughtered will form the nucleus of the great herds which ought to be roaming all over the hills and fields of our Islands. I have visited a great many provinces in the Islands, and I have traveled quite a good distance by bull cart, carromata, steam launch, etc., and I have seen the grazing lands very generally bare of cattle, and I want to say to you all that, as a business man, if I were looking for investments I would avoid the business of raising cattle in the Philippine Islands. It is our duty, however, to change conditions so that a man can be confident that he is not liable to lose his whole principal when put into cattle. It is very important that a definite policy be established and agreed upon by all hands; not only agreed upon but thoroughly believed in. A man does better when he is working on a system that he thoroughly believes in, and for that reason I approve of the convention of veterinarians, as it is a means of bringing together the people of different views, different experiences, and giving them an opportunity to compare their experiences, adjust their differences, argue out their different theories, and finally reach a conclusion as to the best method of coping with the situation, and thus reinforced each of you will return to

his work with fresh impetus, fresh enthusiasm, and new ideas and knowledge.

We are most fortunate in having just now at the head of the Army in the Philippine Islands, at this particular juncture, General Bell, who has come out here with the determination to make things go. He looks at things in a large way. He has not lost any of his former enthusiasm now. When I told him about the conditions here as regards the rinderpest situation, and when I then asked him for Scouts to help us out, he at once said "Yes," and things are being arranged so that we can have Scouts to help us.

The history of our work in the fighting of rinderpest up to now is a history of a series of experiments, valuable and instructive, but it is not the history of a big, adequate campaign undertaken with the necessary men and money to really hope to cope with the situation so trying as that with which we have been all this time confronted. In view of the fact that some of these efforts have been of an experimental nature and have not succeeded it is not to be expected that the Filipino will have acquired a complete confidence in the measures of the Bureau and the measures of the Government. It is to be expected that he will very naturally and very probably be inclined to hold off a little bit and take the suggestions of the Government with a grain of salt. In view of the fact that errors have been made in some particulars by the Government, it is our duty now to be extremely patient in our effort to establish our new system of combating the disease by quarantine, to hear with sympathetic ears the complaints and objections of the people affected, and to so conduct the campaign as to interfere as little as possible with the agricultural and industrial work of the country.

The Constabulary at one time were paying their officers too little and were not getting the best class of men. They became very unpopular with the Filipino people. A good deal of power was put into the hands of these men who were not of sufficient moral fiber to withstand temptations. There were a good many complaints made against them as a result. These complaints were sometimes referred to the very officers in question, who would whitewash themselves. When I first came to the Islands there was a very general feeling among the people against the Constabulary. In the provinces it was quite common for a Constabulary officer to send one of his men with an escort, to ask the president of the municipality to call upon

him. Perhaps at that time the officer was only a third lieutenant who might be a new arrival from the States. All this was entirely unnecessary. As a matter of courtesy the Constabulary officer ought to have called on the president himself in his office, he being the chief executive in the town, it was an abuse of his position for the Constabulary officer, whoever he was, to have sent for him to come. He ought to have gone to him. These new men did not all know the language to begin with. Almost all misunderstandings between people arise from the misunderstanding of words. How many times are they multiplied where the people do not use the same language? For that reason I want to impress upon you all the necessity of learning local dialects and the Spanish language. Get busy and learn the language of the people you are seeing. It is very easy to say, "Let them learn our own language." They will not. You will not find them to be a people that will get busy and learn your language. You are the intruder. You should learn their language. The man who will make the biggest success in his district is the man with two-thirds ability to get on with the natives and one-third of technical ability. To get the coöperation of the people you should be able to communicate with them. It all amounts to using a little tact and courtesy with them. Try to render little services to the people, treat them in a courteous and kindly way; that is something that the Filipino responds to more than any one thing. If you can render them little services, if you have done something for them, they will remember that act and will turn to you and help you and you will find that they are your friends. What you want to do is to get every single card in your hands, and the respect and affection of the people with whom we are dealing is the most important single asset in carrying out a successful campaign for clearing up the rinderpest in any single district that you may be in. Instill in your subordinates the conviction that what is expected of them is hearty coöperation with the people. This may seem a little bit in conflict with the necessity of reporting against certain officials in case they fail to assist you in your work. In case you fail to get assistance from some official, and in case you meet with hostility to the measures of the Bureau, you may have to report him to your chief, who will in turn report him to me and I will put the screws on. I have gone so far as to remove certain provincial and municipal officers; I have suspended officers; I have reprimanded a considerable number, and I have written

letters of suggestion urging them that assistance be given from time to time.

In conclusion I want to thank you all for your attention, and I hope that the result of this meeting will be the united efforts on the part of everyone present to cope to the utmost with this mighty problem.

RESPONSE BY THE DIRECTOR OF AGRICULTURE.

It is with a feeling of pride that I appear as your representative to make the response to this address of welcome. This pleasure is heightened by the fact that I had the honor of bringing together the forces which were united to form this association, composed of men who are engaged in two distinct lines of veterinary work in the Philippines which are vitally connected with the two branches of the Government—the Federal and the Insular. There could not be a more auspicious occasion on which to say a few things which have remained unsaid for many years, and I hope to bring them out this morning so as to lead to a better understanding between us and those to whom we are responsible.

The problems presented to those associated with the Army in the Philippines are different from those confronting the Insular veterinary service. In the Army, veterinarians deal largely with problems pertaining to the management of American mules and horses, and the work is much the same as in the United States. I shall deal primarily with those things that pertain to the diseases of the Philippines which concern the Insular Government rather than the military.

The veterinarians of the quartermaster's department first directed attention to the prevalence, to the seriousness, and to the best means of combating the diseases with which we are dealing to-day, particularly of surra and rinderpest, while foot-and-mouth disease was regarded as of secondary importance. Those of you who have read former yearbooks and reports of the Department of Agriculture and the Bureau of Animal Industry remember those descriptions of the treatment of horses for surra in the early days. With your present knowledge of the disease you would not use those methods now. At one time the city of Manila had for a veterinary inspector of the port a quartermaster veterinarian who had never seen a case of rinderpest and who had only a theoretical knowledge from books. The disease was being imported on almost every ship that came here until a large cargo came one day and so many animals were

dead on board the steamer that it could not but attract attention. From that day we have realized that one of the greatest problems confronting the Insular Government has been to prevent the constant importation of contagious diseases from outside countries, and far more important than that is the spread of those same diseases within our territory. Not long ago I was reading a speech made before the Congress of the United States and found in it a statement to the effect that the Bureau of Agriculture had had an existence of about eight years, and notwithstanding this long time to work out the problems for the suppression of these animal diseases, the Bureau of Agriculture had made a failure of it and that the diseases were as bad to-day as they had ever been. There were several errors in that speech. The fact that the Bureau of Agriculture has been organized that long does not mean that it is responsible for those diseases prevalent during the time the veterinary work was in the hands of the Bureau of Science or the Board of Health. The Bureau was not responsible for this work at any time or in any manner prior to November 1, 1905.

At the time the man who has just given you this excellent address was placed in the chair of Governor-General, the conditions were practically as bad as they had been at any time in the past. It is true that a smaller amount of disease existed then than to-day, but the fact remains that the diseases were here, extensively distributed and wreaking the most terrible destruction upon the animal life of this country. That fact and the general failure to remedy the condition has given rise to the belief that you gentlemen, representatives of the Bureau of Agriculture as veterinarians, have been at a disagreement as to how to proceed. Since November 1, 1905, there has been no disagreement among the veterinarians of the Bureau of Agriculture as to the methods to be followed to gain the desired end. There has been one lone object in view and that has been *the absolute extermination of these diseases*. Palliative measures will never give satisfactory results. We have absolute faith in our ability to accomplish what we have set out to do. The livestock industry in the past has been uncertain and is to-day in that condition which insurance companies would classify as "extra hazardous." I have just returned from a southern trip in which I have seen the conditions as I have never seen them before. A gentleman a few years ago started, in Davao, a herd of cattle. He increased his herd to 700 head and made a living for himself. A few weeks ago rinderpest was introduced into

that district, his herd was the first to get the infection, and in two weeks it was destroyed. The work of seven years was absolutely wiped out. There is no assurance against these occurrences under the conditions that exist to-day. I think that the Philippines are particularly fortunate in having at the helm of the Government to-day a man who is capable from his long and intense business training of hearing the business side of this question and viewing it from the standpoint of success or failure in business and seeing the commercial importance of this question in its relation to the industries, the trade, and the future development of this country. He has set himself the task of finding out the causes for the presence of these plagues and the means by which we can get rid of them. He is the first man in the responsible post which he occupies who has been able to see these things as he has seen them, and whenever you have success in the extermination of rinderpest or surra as you have had already in foot-and-mouth disease, you can give a large part of the credit to the man who first saw the business side of this question. The first consideration after the problem was placed before him was, "What do you need to effect the desired result?" When he got the answer it was divided into three branches. First, financial support. This Governor-General did not wait for anything but went to the Treasury and obtained the money for an enlarged veterinary force and started the campaign. He has received the hearty applause of all who have known the great value of this measure. He has given you the means of doing what you were unable to do before from lack of financial support. Second, the adoption of a policy which established a means of controlling these diseases along sanitary lines long since approved all over the world where veterinary science is a recognized profession. When you are going to stop a disease affecting an animal the only common-sense thing to do is to stop the movements of that animal and limit the infection to a small center. The Governor-General has provided the means of carrying out a successful sanitary campaign. Third, the liberal use of the police power in the veterinary work, which is the key to the situation to-day, the one thing which will give success if the present policy is carried forward. I have just made a trip through districts that three months ago were just riddled with disease. In Leyte, after circling around that island and touching at several ports where disease had formerly existed, we found that no cases had occurred for a week or more.

I would like very much to say a great many things along this line and to recount a great many of the successes in detail. I regret very much that through lack of time we were unable to call in a great many patient workers of the veterinary force. I hope that you who are present will carry to them a message of good cheer. Tell them, when you go back, that the Governor-General is standing right back of the veterinary force with all the support that he can command. I thank you all for your attention, and hope you will have a series of pleasant and profitable sessions.

THE THIRD ANNUAL MEETING OF THE PHILIPPINE
VETERINARY MEDICAL ASSOCIATION, MANILA,
FEBRUARY 25, AND 27, 1911.

By Dr. DAVID C. KRETZER,
Secretary-Treasurer of the Association.

The Third Annual Meeting of the Philippine Veterinary Medical Association was held at the Young Men's Christian Association building, Manila, commencing at 10 a. m. on Saturday, February 25, 1911.

The meeting was called to order by the president, Dr. W. P. Hill, who reviewed the work which had already been accomplished by the veterinarians in the Philippines, and emphasized the importance of coöperation and organization, and suggested that measures be taken to regulate the practice of veterinary medicine and surgery in the Philippine Islands.

In a few appropriate words the president introduced His Excellency the Governor-General as the first speaker. His Excellency addressed the meeting, reminding the veterinarians of the importance of their work, and the necessity of the elimination of dangerous communicable animal diseases, in order that the agricultural industry in these Islands might be developed, all of which is so vital to the prosperity of the Filipinos. The Governor-General is taking a keen personal interest in the ultimate success of the veterinarians in the Archipelago, thereby encouraging them to greater, if possible, or at least renewed efforts with a firmer determination to conquer, in the face of almost insurmountable difficulties, the dangerous animal diseases existing in these Islands.¹

In response to the Governor-General's address, the Director of Agriculture enumerated some of the difficulties that had been encountered in the past by the Bureau of Agriculture in its efforts to suppress and eventually eliminate diseases among

¹ The address of the Governor-General and that of the Director of Agriculture are published elsewhere in this number.

the animals in the Islands, and pointed out some of the essential requisites necessary to carry on successfully the work already started and to terminate the campaign at the earliest possible moment. Doctor Nesom concluded his remarks with an expression of appreciation for the words of encouragement with which His Excellency had favored the association.

Dr. W. H. Boynton, pathologist, Bureau of Agriculture, gave an interesting and instructive discourse on the subject of pleuropneumonia, illustrating his lecture by means of diagrams, photographs, and pathological specimens, showing the various phases of the disease.

Doctor Boynton was followed in his remarks by Dr. David McKibbin, who read a paper on osteoporosis, citing certain cases that had come under his personal observation at the Trinidad stock farm, near Baguio, subprovince of Benguet, which are probably the first authentic cases that have been reported in the Philippine Islands.

An extremely interesting talk was given by Dr. Archibald R. Ward, chief veterinarian of the Bureau of Agriculture, on appropriate and practical methods in dealing with rinderpest, with a view to eliminating eventually this dread scourge which has demoralized the agricultural industry of the Islands. Doctor Ward dwelt at length upon the results obtained by the use of the simultaneous method of inoculation, as compared with the antirinderpest serum inoculation alone, and enumerated some of the obstacles in attempting to carry out the former method of inoculation in the Islands. Doctor Ward advocated the destruction of all animals sick with rinderpest, and, in certain instances, susceptible animals that have been exposed to the disease, together with rigid quarantine, isolation, and thorough disinfection, as being the only measures known at present which are practical in dealing with rinderpest in the Philippine Islands. These conclusions were concurred in by a majority, if not all, of the veterinarians present. The methods above mentioned were successfully practiced in Europe one hundred and fifty years ago.

After some discussion on the subject, it was unanimously decided to give a banquet at the Hotel de Francia at 6.30 o'clock Sunday evening, February 26, 1911.

In view of there being many other important subjects to be discussed, and owing to the lateness of the hour the meeting adjourned to meet at 10 a. m. on Monday, February 27, 1911.

Sunday evening about thirty members of the association and several distinguished visitors met at the Hotel de Francia, where,

after an enjoyable dinner, the following speakers were introduced in a few appropriate and well-chosen words by the toastmaster, Dr. G. E. Nesom, Director of Agriculture.

The president of the association, Dr. W. P. Hill, veterinarian, Second Field Artillery, United States Army, stated that at the present time the veterinarians in the military branch of the service are not receiving the proper recognition by the Federal Government, and that all former efforts to have this branch of the service properly recognized had been defeated; he urged that each member of the association exercise his personal influence toward securing necessary legislation, to the end that veterinarians of the United States Army be given the rank which they deserve.

Dr. Archibald R. Ward, chief veterinarian, Bureau of Agriculture, dwelt particularly upon the necessity of rigid measures being adopted in order to suppress and eliminate rinderpest in the Archipelago; stating that it would be advantageous, in addition to the Philippine Constabulary, to obtain the aid of the military authorities by utilizing Philippine Scouts in maintaining an effective quarantine in those areas where rinderpest exists; that certain legislative and financial cooperation is urgently needed; and that the Insular Government should assume the responsibility in dealing with dangerous communicable animal diseases in the Archipelago, thereby relieving the provincial and municipal governments, as much as possible, of such authority. He cited instances of failures of the local authorities to cope successfully with such diseases, and he also recommended that the owners of diseased animals be compensated for animals killed in the interest of the public welfare.

Prof. C. V. Piper, Agrostologist, United States Department of Agriculture, at present in the Islands investigating the forage question, spoke entertainingly of his first impressions of the Islands, and dwelt at some length upon the wonderful agricultural possibilities of the Tropics.

The association was next favored with an address by His Excellency Governor-General Forbes, who enumerated some of the difficulties that might be encountered in obtaining for the Bureau of Agriculture the desired financial and legislative assistance, but stated that he would do all in his power to aid the Bureau to suppress and eliminate the dangerous animal diseases in the Islands. Such assurance, coming as it did from the Chief Executive, was very gratifying to the Association; and, as a result, every veterinarian present will return to his station with a firmer determination than ever to eradicate rinderpest in the Philippine Islands.

After these speakers had concluded their remarks the toastmaster, Doctor Nesom, in a manner no less pleasing than it was earnest, expressed the thanks of the association for the interesting talks with which it had been favored. In reply to the address of the Governor-General, Doctor Nesom assured His Excellency of the appreciation felt by him for the personal interest displayed in the work of the Bureau of Agriculture.

The closing session was held at 10 a. m. Monday, February 27, 1911.

Mr. M. B. Mitzmain, veterinary entomologist, Bureau of Agriculture, read a carefully prepared and interesting paper on the various methods by which certain diseases are disseminated by different varieties of insects, with special reference to the methods of conveying surra.

Dr. Alvin Broerman, instructor in anatomy in the College of Veterinary Science, University of the Philippines, which has been recently established in Manila, stated that a course of study is being given, extending over a period of five years; the requirements for admission being a high-school degree. Attention was called to the fact that during the recent session of the Philippine Legislature, provision was made for ten scholarships for students in the Veterinary College. This will give deserving Filipinos opportunity to become trained in a profession of vital importance to the prosperity of the country.

Dr. W. P. Hill, president of the association, gave an interesting talk on practical surgery, referring particularly to surgery of the horse's foot. He pointed out that very extensive operations involving the removal of large portions of the hoof, could be carried out without permanent injury.

Dr. Stanton Youngberg, traveling veterinary inspector for Luzon, gave an interesting talk on his personal observations of rinderpest in the provinces, citing cases he had seen where hogs had contracted rinderpest and then conveyed the disease to cattle; he stated that under certain rare conditions rinderpest infection apparently remains virulent for months. The remarks brought out a discussion by Doctors Ward, Boynton, Hill, McKibbin, and Decker.

Dr. Frank C. Gearhart, chief of the division of animal husbandry, formerly acting chief veterinarian, Bureau of Agriculture, stated that during his tenure of office as acting chief veterinarian the antirinderpest serum treatment was about the only measure that could be practiced at that time; that the more satisfactory measures in vogue to-day were not favorably regarded at that time, owing to conditions over which he had

no control; that it was his opinion then, as it is now, that the only practical means by which rinderpest may be eliminated is the one now advocated by Doctor Ward, and practiced, so far as possible, by the Bureau of Agriculture.

Doctor Gearhart suggested that the veterinarians from the provinces exercise their influence with the representatives of the people in their various districts, urging that the necessary legislation be enacted, and appropriations be made, with which to reimburse the owners of animals which it is found necessary to kill in the interest of the public welfare. The suggestions of Doctor Gearhart were well received by the members of the association.

The election of officers took place and resulted as follows: President, Dr. Archibald R. Ward; vice-president, Dr. Joseph Jefferes, veterinarian, Seventh Cavalry, United States Army; secretary-treasurer, Dr. David C. Kretzer.

The secretary of the association was instructed to notify Dr. Joseph Jefferes of his election, upon his arrival in the Islands on the next United States Army transport.

As there was no more business to come before the association, it was moved and seconded that the meeting adjourn to meet at the call of the president.

BAGUIO, BENGUET, *April 20, 1911.*

It was moved by Doctor Ward and seconded that the following resolution prepared by Dr. G. E. Nesom and Dr. F. C. Gearhart, committee on resolutions, be accepted by the association. The motion was unanimously carried.

RESOLUTION.

Whereas His Excellency the Governor-General has at all times given both his official and personal support to the members of the veterinary profession in the Philippines; and

Whereas his keen and sympathetic interest in the work of this association has been a stimulus to its individual members to renewed efforts in the great task which they have undertaken in these Islands: Therefore, be it

Resolved, That we, the members of the Philippine Veterinary Medical Association, do hereby express our appreciation for this support, this interest, and the very gracious consideration with which this association has been favored by His Excellency; and be it

Further resolved, That this resolution be made a part of the regular minutes of the annual meeting of this association and that a copy be sent to His Excellency the Governor-General.

REPORT ON THE RECENT OUTBREAK OF RINDERPEST IN THE DISTRICT OF DAVAO, MINDANAO.

By C. G. THOMSON, D. V. M.

In accordance with travel orders dated December 3, 1910, I sailed from Manila with Mr. R. E. Burris on the United States Army transport *Seward* on December 4, and arrived at Zamboanga on December 7. I immediately presented my letter of introduction to Brig. Gen. John J. Pershing, governor of the Moro Province, and in conference with him and Colonel Richards, the provincial health officer, discussed the Davao situation at some length. Very little was known in Zamboanga at that time as to the nature or extent of the outbreak, but both Brigadier-General Pershing and Colonel Richards realized the menace presented by the existence of rinderpest infection in the Moro Province and assured me that they would support us in any reasonable measures which we might recommend, providing such measures offered some hope of success.

With Brigadier-General Pershing we sailed on the U. S. Army cutter *Samar* on December 10, arriving at Davao December 14. After several days spent in studying local conditions as to the extent of the infection, distribution of susceptible animals, avenues of animal travel, and the distribution of Scouts and Constabulary for quarantine work, I submitted a letter to the governor of the Moro Province recommending that the sum of ₱7,500 be made available for transportation and indemnification of owners for slaughtered animals. In response I was informed that no funds could be made available at that time for the purpose of indemnification, but authorization was made for reasonable expenditures for transportation. I secured a small launch and used it almost constantly during my stay in Davao.

In the letter to the governor of the Moro Province, above mentioned, I submitted copies of ordinances covering certain quarantine provisions necessitated by local conditions and not anticipated in Act No. 1760 or the acts of the Moro Province.

Emergency health ordinance No. 1, passed by the provincial board of health on January 1, 1911, covered the desired points.

After a very careful study of the situation, I became convinced that only by the most drastic measures could the eradication of the infection be accomplished. The outbreak had already encompassed an area of over 150 square miles. The infection was of the most virulent type, and the rugged nature of the country made operations difficult in the extreme. Accordingly, fortified with the Insular and provincial laws, we proceeded to institute and enforce the most rigid restriction of the movement of all classes of domestic animals, to kill all animals found infected and other susceptible animals considered as being directly exposed to infection. My first concern was to guard against further spread of the disease. This was accomplished by establishing a series of Scout patrols well beyond the most remote known infections, to prevent the escape of any animal from within the infected zone. Detachments of Scouts were then stationed in the barrios within the infected area to tie up or corral every carabao, head of cattle, horse, pig, goat, and dog. Before taking stations the quarantine detachments were given brief instructions as to the nature of the disease, conditions tending toward its spread, and the nature of their duties, which consisted, briefly, in taking an accurate census of all classes of domestic animals in their districts, securing them in corrals or by ropes, and inspections twice daily to insure against their movement and detect infection. From certain barrios detachments were sent morning and afternoon to patrol the trails running from the coast to the mountains, in order to prevent the movement of animals north or south. Written reports were submitted at my office in Davao every Wednesday and Saturday, and an immediate report was made of new developments of any nature.

The quarantine regulations provided for the absolute restriction of the movement of animals within the infected area excepting in the town of Davao, where horses and dogs were permitted in the streets. It was desirable to permit the use of horses because practically all of the shipping interests are centered in Davao, it was therefore, necessary to make some provision for the transportation of merchandise. Very little hardship or inconvenience was caused by rigid quarantine in the outlying districts, as most of the towns and plantations are located on the shores of the Gulf of Davao, and transportation is mostly by launch or native boat. The *hacenderos* did not suffer through the enforced idleness of their carabaos and cattle,

as very little land is cultivated. I considered it best to tie up horses and dogs outside of the town of Davao because they present some little danger as infection carriers, and in view of the drastic measures taken we could not afford to overlook even such agents of infection.

I made inspections of the detachments in the infected area nearly every day and of the more remote posts as often as possible to stimulate interest in the work, to further instruct the soldiers and to keep in touch with the changing conditions. On all of these trips of inspection I was accompanied by a ranking Scout sergeant, through whom I issued all orders, also by a Constabulary private, who arrested the men whom it was occasionally necessary to prosecute.

The infected area was limited on the north by a creek near the barrio of Ylang, on the south by the Taloma River, on the east by the sea, and on the west by the Apo mountain range. Many of the animals in the barrio of Taloma were infected and this condition presented a grave danger to the large herds to the south; therefore, our first efforts were directed toward cleaning up this district. In all of the work, the scheme of daily inspection, the absolute prohibition of the movement of all classes of domestic animals, the immediate slaughter of all sick and directly exposed animals with a through chemical disinfection of contaminated corrals and wallows, was carried out as thoroughly as possible.

The enforcement of the quarantine of carabaos and cattle in the town of Davao proper interfered seriously with business, so it was desirable to hasten the accomplishment of the task there. Accordingly, I had Mr. Burris remain in Davao much of the time for the first few weeks. No soldiers were used in the town of Davao, as two efficient native policemen were detailed for the service by the municipal president, Lieut. W. H. Dade. The infection in Davao yielded readily to the measures initiated so that during the last week in January it was possible to relieve a few work carabaos and cattle on pass and under guard from quarantine during the days just preceding and following the arrival of boats. The quarantine provisions against horses and dogs were, of course, never enforced in the town of Davao, for obvious reasons.

No animals were slaughtered except under my personal direction with the exception of a few suspected cases which I directed Mr. Burris to destroy whenever unmistakable symptoms developed. In almost every case the owners readily consented to the slaughter, and there were but few exceptions. I recorded

the names of owners, the class of animals, estimated the value of all animals slaughtered, and in accordance with the laws of the province submitted this list to the district governor. No provision has been made for the indemnification of these owners. In my report to Brigadier-General Pershing I recommended that payment be made for part of the value of these animals. The provincial authorities fully realize the justice of such payments but in view of its revenue available the province is not able to reimburse the owners.

As a result of the methods instituted no cases of rinderpest developed in the town of Davao after January 16 and none in Taloma after January 12. The cases in Taloma were the last discovered south of the Davao River, so from the middle of January we were able to concentrate our efforts on the district north of the river. Considerable losses were sustained in this district during the latter half of January due to infection occurring among animals at Sasa and at Panacan. The disease persisted in these two barrios until February 2, but offered no danger to other animals as they were secured under guard and subject to daily inspection.

The last case appeared on February 2 and the quarantine was maintained in full force until March 2 in accordance with the plan decided upon during the inspection trip of the Director of Agriculture to Davao on February 17.

Realizing that some danger remains through undiscovered cases and contamination of wallows and swamp lands, we have closed the heavily infected trail between Taloma and Davao against use by carabaos and cattle, and by municipal ordinances have warned the people not to pasture their susceptible animals in certain sections.

Lieutenant Dade, president and district health officer of Davao, has consented, at my request, to maintain Constabulary patrols who will inspect the cattle of the infected area twice weekly to make sure of prompt detection if the disease reappears, and to enforce the quarantine on this trail.

To the best of my knowledge the total loss sustained by the district of Davao during this epizootic was 2,535 cattle and 133 carabaos, a total of 2,668 animals. Of these 372 died after our arrival on December 14, 1910, and about 200 of the 372 died during the first week before I was familiar with the conditions. Of the 372 only 82 were slaughtered as "exposed" or "infected." The term "exposed" signifies that the animals were considered as being in the incubation stage of the disease.

The success attending this work may be attributed principally to three factors:

(a) Adequate laws and ordinances of the province, which, coupled with the influence of the officials, enabled us to maintain the necessary rigid quarantine and to accomplish the slaughter of infected and exposed animals.

(b) The satisfactory transportation which permitted constant inspection of suspects, thus rendering their slaughter possible in the incubation period before they became highly infectious.

(c) The use of the Philippine Scouts, who proved to be a most efficient arm for effective quarantine service.

The work of the Scouts can not be commended too highly. They followed instructions implicitly and intelligently, took a keen interest in the work and refrained from abusing their authority. I feel confident that the situation could not have been handled successfully if their services had not been available.

I received the most cordial support and coöperation from all of the officials with whom I came in contact, and I am especially indebted to Lieutenant Dade who, as municipal president, exerted an invaluable influence.

Efforts to trace the source from which the infection entered the district were unsuccessful. The original supposition that it was carried down from Surigao by deer or wild hogs as hosts, was not supported by facts, as no infection was discovered among wild animals. I tried to secure deer for exposure to infection that their susceptibility might be demonstrated conclusively, but did not succeed in obtaining subjects until the infection had subsided. I am of the opinion that the infection was introduced into the town of Davao through importation from Cebu, and that it smouldered there several months before enough animals had succumbed to provoke its recognition as an epizootic. The first case was observed by Lieutenant Dade on October 8, 1910, in the town of Davao. Later it spread across the river into the large herds in the adjacent fields.

While in Davao, the Director of Agriculture directed that I investigate the eastern coast of Mindanao as to the existence of rinderpest, provided I could make the trip within a reasonable period of time. The conditions were such that I considered it inadvisable to leave Davao for this purpose. Lieut. H. H. Smith, consented to perform this task, and his report shows that no disease exists within that region.

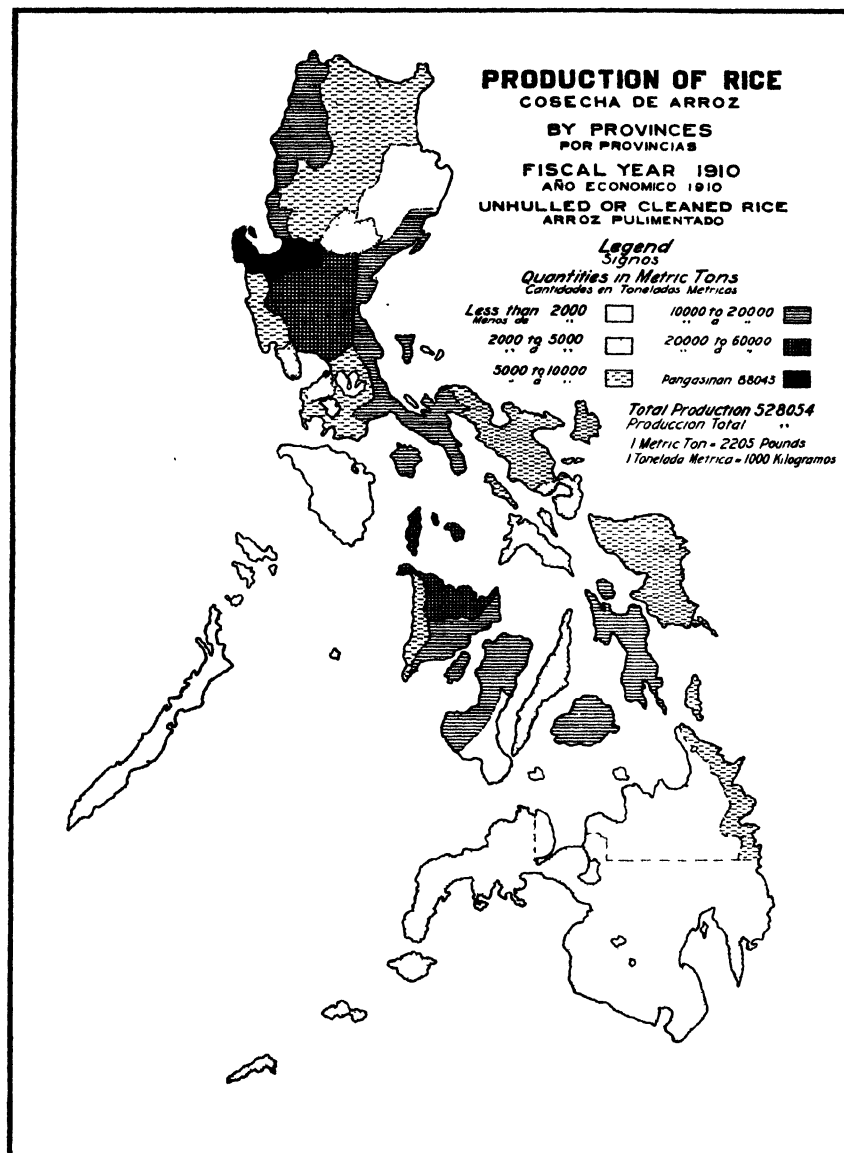
STATISTICS REGARDING RICE AND HEMP GROWING IN THE PHILIPPINE ISLANDS.

By W. D. HOBART, *Statistician.*

STATISTICS ON RICE IN THE PHILIPPINE ISLANDS, FISCAL YEAR 1910.

Province.	Amount of paddy produced.	Equalling in cleaned rice.	Area cultivated.	Cleaned rice per hectare.
	<i>Cavans.</i>	<i>Metric tons.</i>	<i>Hectares.</i>	<i>K'ilos.</i>
Agusan.....	6,400	179	765	234
Albay.....	209,421	5,864	17,107	343
Ambos Camarines.....	341,550	9,568	24,728	387
Antique.....	342,446	9,588	31,938	800
Bataan.....	149,986	4,200	8,261	508
Batangas.....	263,974	7,391	33,492	221
Bohol.....	397,748	11,137	38,059	387
Bulacan.....	1,239,687	34,711	52,016	667
Caagayan.....	301,841	8,462	21,249	398
Capiz.....	908,222	25,290	69,226	365
Cavite.....	174,371	4,882	15,086	325
Cebu.....	32,298	2,304	6,338	347
Ilocos Norte.....	652,691	18,275	43,170	423
Ilocos Sur.....	576,919	16,154	39,080	413
Iloilo.....	591,574	16,564	45,254	366
Isabela.....	39,353	1,102	3,142	351
La Laguna.....	231,373	6,478	18,229	355
La Union.....	675,496	18,914	44,680	424
Leyte.....	441,454	12,861	22,957	538
Mindoro.....	41,919	1,174	3,578	328
Misamis.....	69,375	1,942	6,629	293
Moro.....	108,084	3,026	6,182	489
Mountain.....	319,416	8,944	17,369	515
Nueva Ecija.....	2,153,718	60,304	90,778	664
Nueva Vizcaya.....	95,130	2,664	6,284	424
Occidental Negros.....	620,804	17,883	29,154	596
Oriental Negros.....	69,237	1,940	3,862	502
Palawan.....	58,491	1,638	5,292	310
Pampanga.....	1,056,907	29,698	71,686	413
Pangasinan.....	3,144,392	88,043	175,703	501
Rizal.....	329,852	9,286	16,758	551
Samar.....	312,914	8,762	15,830	553
Sorsogon.....	151,195	4,233	16,549	256
Surigao.....	179,320	5,021	12,506	402
Tarlac.....	1,687,708	47,256	135,255	349
Tayabas.....	516,712	14,468	30,244	478
Zambales.....	322,058	9,018	18,510	487
Total.....	18,859,086	528,054	1,192,141	442

The difference between the various provinces in the production per hectare is in part accounted for by destruction or curtailment of crops in some of them through drought or storms; or because of locusts, rats or other pests or blights.



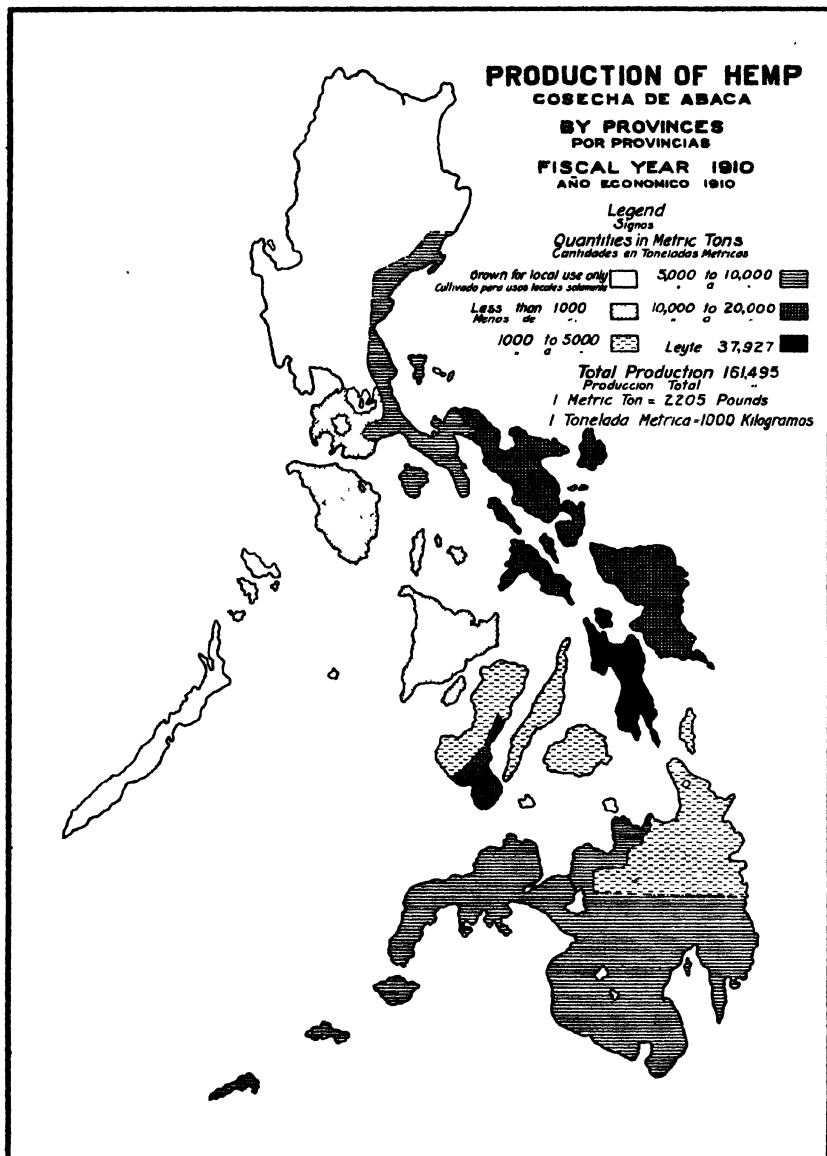
THE PHILIPPINE ISLANDS.

STATISTICS ON HEMP IN THE PHILIPPINE ISLANDS, FISCAL YEAR 1910.

Province.	Amount of hemp produced.		Area cultivated.	Production per hectare.
	<i>Piculs.</i>	<i>Kilos.</i>	<i>Hectares.</i>	<i>Kilos.</i>
Agusan.....	24,568	1,558,610	2,394	649
Albay.....	816,154	19,996,740	91,776	218
Ambos Camarines.....	269,202	17,027,027	101,600	167
Antique.....	2,090	182,192	1,009	181
Bataan.....			5	
Batangas.....	1,964	124,228	659	189
Bohol.....	28,817	1,474,800	7,082	208
Bulacan.....				
Cagayan.....			26	
Capiz.....	14,829	906,809	7,284	125
Cavite.....	11,820	747,615	1,929	888
Cebu.....	40,854	2,584,015	9,095	284
Ilocos Norte.....				
Ilocos Sur.....				
Iloilo.....	7,254	458,815	1,647	279
Isabela.....				
La Laguna.....	13,248	837,620	6,650	126
La Union.....				
Leyte.....	599,636	87,926,977	69,191	548
Mindoro.....	5,179	827,672	1,105	296
Misamis.....	111,652	7,055,664	11,466	615
Moro.....	135,848	8,592,396	16,410	524
Mountain.....				
Nueva Ecija.....				
Nueva Vizcaya.....				
Occidental Negros.....	16,828	1,064,371	4,659	228
Oriental Negros.....	172,016	10,780,012	17,359	621
Palawan.....			1,800	
Pampanga.....			3	
Pangasinan.....				
Rizal.....			10	
Samar.....	298,882	18,901,124	27,593	685
Sorsogon.....	887,172	24,488,629	75,091	826
Surigao.....	61,868	8,913,151	5,085	770
Tarlac.....			2	
Tayabas.....	149,554	9,559,290	14,756	648
Zambales.....				
Total.....	2,668,275	168,452,144	475,136	855

The great differences between the various provinces in production per hectare is in part accounted for by the fact that it has not been found possible to obtain information as to what proportion of the hemp plants reported are actually in bearing.

It is well known, too, that in many localities where low grades are grown the price obtained has not paid for harvesting, so the crop has been allowed to go to waste. In other localities lack of labor has made it impossible to harvest at the proper time resulting in partial or total loss of the crop.



THE PHILIPPINE ISLANDS.

THE CONSTITUTION AND BY-LAWS OF THE INSULAR AGRICULTURAL ASSOCIATION OF THE PHILIPPINE ISLANDS.

(Adopted February 24, 1911.)

ARTICLE I.—*Name.*

This Association shall be known as The Insular Agricultural Association of the Philippine Islands. It shall consist of active, associate, and honorary members, and shall have its headquarters and offices in Manila.

ARTICLE II.—*Object.*

The objects of this association are to promote harmony and coöperation between the farmers of the country, to study and become familiar with the most modern methods in tropical agriculture, to defend the interests of the farmers of the country, and to promote the general development of agriculture as the foundation of the future prosperity of the Philippines.

ARTICLE III.—*Officers, etc.*

SECTION 1. The officers of this association shall be a president, first vice-president, secretary, treasurer, and a vice-president for each province represented at the regular annual meeting of the association. The term of office of the president, first vice-president, secretary, and treasurer shall be one year or until their successors are chosen. They shall without delay transfer to their successors all property belonging to the association.

SEC. 2. The provincial vice-presidents shall be divided into three classes. The first class shall hold office for a term of one year, the second class for two years, and the third class for three years. Their successors shall hold office for three years, one-third of class being elected each year. New officers shall be elected by ballot each succeeding year at the regular annual meeting of the association. A majority vote of all of the active members of the association shall be necessary for an election to each office. A vacancy in any office shall be filled by an appointment by the president until the next regular election.

SEC. 3. The president, first vice-president, secretary, treasurer, and provincial vice-presidents shall constitute a board of directors which shall control the general policy of the association, subject to such regulations as the active members of the association shall, by a two-thirds vote, prescribe when actually assembled in the regular meetings of the association.

SEC. 4. The duties of officers, requisites for membership, times of annual or other meetings of this association, and such regulations as may be necessary for the government of the same shall be provided for in the by-laws.

BY-LAWS.

ARTICLE I.—*President.*

SECTION 1. It shall be the duty of the president to preside at all meetings of the association, to present an address at the annual meeting following his election, to preserve order and decorum, and to direct the discussions.

SEC. 2. The president shall represent the association and the board of directors at all agricultural expositions, congresses, conferences, associations, or meetings at which the association desires to be represented. This, however, is not to be construed as interfering with the election of other delegates or representatives which the association considers it desirable to send to such expositions, congresses, conferences, or meetings.

SEC. 3. He shall see that the various officers of the association perform their duties in compliance with the constitution and by-laws of the association.

SEC. 4. He shall authorize over his signature the payment of all bills contracted either directly by the association or by its properly appointed representatives.

ARTICLE II.—*First vice-president.*

SECTION 1. The first vice-president shall discharge the duties of the president in case of the absence, sickness, or inability of the president to attend to the same.

ARTICLE III.—*Secretary.*

SECTION 1. The secretary shall, in a book provided for the purpose, keep a copy of the constitution and by-laws of the association, together with such amendments as shall be made from time to time, which shall be open to the inspection of all members; he shall have general care of all books, papers, and documents belonging to the association.

SEC. 2. He shall keep careful and exact lists of the names of all active, associate, and honorary members of the association, together with their addresses, province by province and town by town; he shall keep a record of the minutes of all meetings of the association, and shall present or read the minutes of the last meeting of the association to the members at the next regular meeting for their approval.

SEC. 3. He shall draw warrants to be countersigned by the president and paid by the treasurer, covering all bills which have been legally contracted by the association; he shall convene the members of the association on the call of the president, the board of trustees, or on the request of not less than one-third of the active members of the association.

SEC. 4. When so ordered he shall prepare an annual report on the work of the association, or prepare a bulletin, which shall be issued monthly, quarterly, or annually, as ordered by the board of directors, furnishing information regarding the improvement of tropical agriculture, the market price of agricultural products, and other matters of interest to the farmers of the country.

ARTICLE IV.—*Treasurer.*

SECTION 1. The treasurer shall collect all fees, assessments, and bills due, and have charge of the funds of the association; he shall give security for the trust reposed in him whenever the association may deem it requisite.

SEC. 2. It shall be the duty of the treasurer to put all of the moneys of the association into one fund to be appropriated for the payment of current expenses and for such other uses as the association may direct.

SEC. 3. He shall pay all bills which come into his hands duly approved by the president and secretary.

SEC. 4. At each annual meeting he shall give a detailed statement of all his official receipts and disbursements which statement must be duly audited and approved by the board of directors.

ARTICLE V.—*Provincial vice-presidents.*

SECTION 1. The provincial vice-presidents shall act in an advisory capacity to the president, first vice-president, and secretary, and their duties on the board of directors shall be primarily in this capacity.

SEC. 2. They shall be the active representatives of the Insular Agricultural Association in their respective provinces, and it shall be their duty to promote the organization of provincial,

municipal, and other local agricultural associations for the purpose of stirring up an enthusiastic interest in modern methods of agriculture on the part of the farmers of the country, and enlisting, so far as possible, the interest and active coöperation of every farmer in carrying out the policy of the Insular Agricultural Association for the development of Philippine agriculture.

SEC. 3. They shall, from time to time, either personally or by correspondence, advise the president and secretary of the association regarding the progress being made in their province along the lines laid down by the association.

ARTICLE VI.—*Board of directors.*

SECTION 1. The board of directors of the Insular Agricultural Association shall meet on the call of the president, during the regular annual meeting of the association, for the purpose of discussing and considering such matters regarding the policy of the association as seem necessary for the proper carrying on of its work and for carrying out the policy outlined.

SEC. 2. Other meetings may be held in Iloilo, Cebu, or Zamboanga, should the time and convenience of the members demand it.

SEC. 3. The president shall preside at all meetings of the board of directors, except in case of his absence or disability, when the first vice-president or the secretary shall assume the duties of the president. The secretary of the Insular Agricultural Association shall be Secretary of the board.

SEC. 4. All questions presented to the board for discussion and deliberation shall require at least a two-thirds vote of the members of the board for their adoption.

ARTICLE VII.—*Purposes.*

SECTION 1. The purpose of this association shall be to promote harmony and confidence among farmers and the general agricultural development of the country.

SEC. 2. It is observed that many of those engaged in the leading occupations of this country are well organized. This association will, therefore, hold meetings of farmers in all parts of the country from time to time to bring them to a realization and understanding of the unity of their interests.

SEC. 3. It will study the needs of the farmers of the country and hold meetings, or farmers' institutes, at which the officials and members of the Bureau of Agriculture shall be invited to give lectures or talks on modern methods in tropical agriculture,

at which the actual adoption of these methods to conditions existing in the Philippines may be discussed, by the farmers themselves, with the representatives of the Bureau of Agriculture.

SEC. 4. The members of the association will cooperate with the Bureau of Agriculture for the purpose of making practical demonstrations of the best methods of growing the staple crops of the country, after the manner of the farmers' cooperative demonstration work in the United States.

SEC. 5. It shall from time to time invite the dealers in agricultural products to attend its meetings, to have them present the conditions of the local market and the world market for the staple products of the country, and to discuss with them ways and means for improving farm product and market conditions in different parts of the Philippines.

SEC. 6. It shall promote the organization of provincial, municipal, and local agricultural associations.

SEC. 7. It shall promote and support the holding of Insular, provincial, and local agricultural expositions, fairs, congresses, conferences, and meetings.

SEC. 8. It shall interest itself in the building of good roads, securing better transportation for farm products, the general improvement and making of life in the country more profitable and satisfactory.

SEC. 9. It shall work for the enactment of laws to protect and promote the best interests of the farmers of the country, namely: (a) To relieve the present financial stress among the farmers of the country by enabling them to get satisfactory titles to their lands and to borrow money from the Agricultural Bank, (b) to establish agricultural credit banks in different provinces, (c) to provide for an agricultural member of each provincial board who shall cooperate with an agricultural committee in every municipality for the purpose of studying agricultural conditions and needs, and making reports on the same from time to time to the officials of this association, and to the Director of Agriculture, for the purpose of securing such cooperation and assistance as the Insular Government can give.

SEC. 10. In addition to the regular annual meeting, it shall meet from time to time, at such times and places as shall be decided upon by vote of the members, the board of directors, or the call of the president, as often as the interests of the members and the work of the association seem to demand.

SEC. 11. It shall send representatives to other tropical agricultural expositions, congresses, conferences, etc., in the Far

East or in other parts of the world, who shall submit a verbal or written report or both, as ordered by the president or board of directors, on the exposition, congress, or conference visited for the benefit of the members of this association.

SEC. 12. It shall work for the organization of a Far Eastern agricultural association, including the agriculturists in those countries who are working on the same agricultural problems as we have to solve in the Philippines, namely, Indo China (including Cochin China and Siam), British North Borneo, Dutch East Indies, Australia, New Zealand, Federated Malay States, Ceylon, and India.

ARTICLE VIII.—*Membership.*

SECTION 1. The members of this association shall be divided into active, associate, and honorary.

SEC. 2. The active members shall include the founders of the association; they must be actual landlords, part owners, lessees, managers of farms, or actually engaged in some branch of agricultural work or research.

SEC. 3. The associate members shall include those who are either directly or indirectly interested in the progress of farming in the country, such as dealers in farm products, shippers, members of chambers of commerce, or boards of trade.

SEC. 4. The honorary members shall include those, who on account of their distinguished position, coöperation, and assistance actually given to the association and to the farmers of the country, shall be elected to such membership by the active members of the association.

SEC. 5. All members shall be elected by a majority vote of the active members of the association. Candidates elected to active membership shall become active members when they have signed the constitution and by-laws binding themselves to conform to them, and paid the required fee to the treasurer of the association.

SEC. 6. Associate and honorary members shall not have the right to vote, neither shall they be eligible for any office, or as members of the board of directors of the association. The secretary shall record in separate lists the names of associate and honorary members.

ARTICLE IX.—*Fees.*

SECTION 1. The membership fee of this Association shall be three pesos (₱3) per annum. No other fees shall be assessed upon members except those necessary for defraying the actual

and necessary expenses of the association, which must be ordered by a two-thirds vote.

ARTICLE X.—*Order of business.*

Roll call.

President's address.

Program.

Communications from board of directors.

Election of new members.

Unfinished business.

Reports of committees.

Miscellaneous business.

New business.

Appointing of committees.

Minutes of preceding meeting, or meetings.

Adjournment to date or *sine die*.

ARTICLE XI.—*Quorum.*

SECTION 1. A majority of the members shall constitute a quorum for the purpose of transacting business.

ARTICLE XII.—*Program committee.*

SECTION 1. The secretary of the association, together with at least three other active members appointed by the president shall constitute a program committee, of which the secretary shall be chairman.

SEC. 2. It shall be the duty of this committee to arrange and prepare programs, which shall consist of instrumental and vocal music, addresses, lectures, papers, literary productions, discussions, etc.

SEC. 3. The regular programs shall follow the general line of work done by farmers' associations which shall include talks, lectures, papers on subjects relative to the staple crops of the country, other subjects of interest to agriculturists, and discussions of the same, for the general improvement of country life.

ARTICLE XIII.—*Affiliations.*

SECTION 1. This association shall not affiliate itself with any political party or religious sect, and any demonstration of a political or religious nature is strictly prohibited as intending to interfere with the harmony of the association and its work, which is for the benefit of all farmers or agriculturists and those interested in the agricultural development of the country, regardless of their political beliefs or religious views.

ARTICLE XIV.—*Interpretations.*

SECTION 1. All questions regarding interpretations of the constitution of this association shall be referred to the board of directors, and the same shall be determined by a two-thirds vote of the members of the board.

ARTICLE XV.—*Removal and expulsion.*

SECTION 1. Officers of this association may be removed from office on their failure to comply with the constitution and by-laws and to discharge the duties required of them, or for other sufficient reasons, upon recommendation of the board of directors and a two-thirds vote of the members of the association.

SEC. 2. Members of this association, who on account of their failure to pay the required dues or assessments, on account of lack of interest, or of behavior such as would become a detriment or discredit to the association, may be expelled upon the recommendation of the board of directors and a two-thirds vote of the members of the association.

ARTICLE XVI.—*Amendments.*

SECTION 1. Members desiring to amend the constitution or these by-laws shall make such recommendation in writing and present the same to the board of directors for their consideration and approval.

SEC. 2. Proposed amendments to the constitution, or these by-laws which have been approved by the board of directors, shall be printed or typewritten so as to show the exact changes intended and a copy shall be sent to each member of the association by the secretary at least three months previous to the next regular meeting or special meeting which shall be called expressly for this purpose, at which time the proposed amendment or amendments if adopted shall be approved by a two-thirds vote of the active members of the association.

MONTHLY VETERINARY REPORTS—MARCH AND APRIL, 1911.

There have been numerous minor changes in the rinderpest situation during the month, but no marked change in the general situation.

Cagayan and Isabela.—One municipality is infected in the Province of Cagayan and three in the Province of Isabela.

Pampanga and Bulacan.—There has been a marked improvement in the Province of Bulacan, and only two municipalities remain infected. The efforts of the Bureau of Agriculture have resulted in still holding the disease in check in Pampanga Province.

Rizal.—During the past month rinderpest has been recognized in four municipalities.

Nueva Ecija.—No disease has been reported during the past month.

Tarlac.—The number of infected municipalities has been reduced to three.

Pangasinan.—The principal operations of the Bureau of Agriculture against rinderpest are being carried on in this province. There is a chain of infected municipalities extending from Tayug to Lingayen, and thence southward to Urbiztondo. There is also an extensive infection of the mountainous country in the western part of the province. About 450 Philippine Scouts are employed in quarantining the plains district. While it is not deemed wise to declare any of the infected municipalities clean as yet, it is evident that the rigid quarantine enforced, is producing favorable results. The provincial and municipal officials are convinced of the good results following the quarantine. A special effort has been made in the campaign in this province to disseminate information regarding the purpose of the quarantine and, in general, the methods of combating rinderpest. An interpreter, possessing a fluent knowledge of the Spanish language, has held meetings in every infected municipality in which operations are being carried on. Interpreters possessing a knowledge of the native dialects are coöperating with him.

Benguet.—The quarantine placed on the Benguet Road near

Camp One, has effectively prevented the infection of the Province of Benguet.

Nueva Vizcaya.—Only two municipalities are infected in this province, and it is believed that disease was introduced by wild deer which have been reported from various localities as dying from some disease. An effective quarantine against Pangasinan Province is being maintained.

La Union.—Infection exists in Aringay and Agoo. Sick animals are being slaughtered there and the owners compensated for the value thereof. This measure is meeting with popular approval, and bids fair to secure and hold the coöperation of cattle owners of this province in the work of the Bureau of Agriculture in eradicating disease.

Visayan Islands.—The situation in the Visayas remains practically unchanged. Strong hopes are entertained that there will be a great improvement before the end of the month. No general outbreak exists. About 300 Philippine Scouts are employed on quarantine duty in the Province of Oriental Negros where the heaviest infection exists.

Moro Province.—A representative of the Bureau of Agriculture has returned from the District of Davao reporting that region free from rinderpest. The report of Dr. C. G. Thomson, in charge of that work, is published elsewhere in this issue of the REVIEW.

MONTHLY CROP REPORTS—MARCH AND APRIL.

MISCELLANEOUS CROPS.

Cavite.—The extent of the damage done to crops in this province along the Batangas border by the falling of ashes from Taal Volcano is estimated to be approximately ₱85,000. A great many of the inhabitants of the barrios of Ulat and Cabaangaan of Silang have moved to other places on this account. It is believed, however, that this volcanic ash will greatly enrich the soil where it has fallen.

Isabela.—In the barrio of Malalang half way between Ilagan and San Antonio potatoes are grown which are as good as those obtained in Baguio. The planting of potatoes in that section of the province should be encouraged.

La Laguna.—In the vicinity of Santa Cruz and Lumban many acres of tomatoes have been planted. The lowlands around the lake are used for this crop. Judging from the rapid growth the soil must be exceedingly fertile in these locations.

Tarlac.—There are many small groves of mangos distributed throughout the province. Also camachiles, lumboy, bananas, etc. Garden vegetables such as tomatoes, radishes, cabbages, and onions are extensively grown.

RICE.

Antique.—Palay is very scarce in the northern part of the province and can not be bought north of Tibiao except in small quantities. The present price is ₱4.17 per cavan.

Cotabato.—The harvesting of the last palay crop has been completed and the Moros of the district appear to be well satisfied with the result of same, although in certain sections they suffered considerable loss from the high water which prevailed during the past three or four months. Five hundred cavans of palay and 350 cavans of rice have been shipped to Jolo and Dumaguete.

Isabela.—Considerable damage has been done to the rice crop in the municipality of Echague by an insect which destroys the stalks of the plant.

Oriental Negros (Siquijor).—The rice crop on this island was in fine condition and about ready to harvest on March 1.

Tarlac.—The second rice crop that is being grown where irrigation is practicable is in good condition and there is a good stand. Not all of the available ground is planted, however, probably because of lack of labor.

Zambales.—The farmers throughout the province are busily engaged in preparing their rice lands for the next crop. Although the crop just harvested was quite large prices continue high, palay bringing ₱2.60 per cavan on the local market.

SUGAR CANE.

Antique.—The northern end of the province continues to report very good results with sugar cane. Some sugar has been shipped from Bugason, Tibiao, and Culasi. The southern end of the province reports that sugar production will be only average in both quantity and quality. A new hydraulic mill has been installed in Tibiao.

La Laguna.—The farmers in this province were busy during the month of February milling cane. An abundant crop was being harvested.

La Union.—The sugar crop will be a large one, all sugar planters reporting favorably.

Nueva Ecija.—More sugar cane is being planted in this province than formerly.

Tarlac.—That part of the crop which is now growing is in excellent condition and gives promise of a good yield. Much of the land is still being planted. The planting of sugar cane should be encouraged in this province as there is a great deal of land in Tarlac that is suitable for sugar cane.

TOBACCO.

Isabela.—In Echague the planting of tobacco is concluded and most of the farmers are busy tending their plantations, while others are already harvesting their tobacco. The present harvest of tobacco at Echague is satisfactory. The sale of tobacco is over in Tagle and half the harvest in Santiago, Echague, and Cauayan has been sold to various commercial companies. In the northern part of Isabela Province the tobacco crop is being greatly injured by some kind of wilt which seems to be new in this valley. Worms have also done a considerable amount of damage all over the province. The dry weather was prejudicial to the transplanting of tobacco during the month

of January. While the heavy rains at the beginning of February greatly improved soil conditions, it ruined many of the small plants. In some sections, due to the irregular season the date of setting has been unusually irregular, some farmers still transplanting when others were harvesting their tobacco.

La Union.—The tobacco crop will not reach the high mark attained last year, owing to the drought.

Nueva Ecija.—More tobacco is being planted in this province than formerly, and the tobacco that is being produced is of a better grade.

CURRENT NOTES.

THE TRINIDAD GARDEN.

Below the Hotel Pines, near the Baguio Hotel, along the road to Trinidad, out toward the mines, and at Haight's Place, every here and there one sees some of the finest vegetable gardens to be found anywhere in the Philippines. All of these gardens bear witness to the success of the seed distribution and extension work which was undertaken some years ago by the station of the Bureau of Agriculture at Trinidad. At this station the growing of both vegetables and forage plants is being carried on. This garden is located in the Trinidad Valley less than an hour's drive, over a good improved road, from the Government Center.

The Trinidad garden includes an area of about 16 hectares, most of which is under cultivation. It is under the direction of Mr. E. S. Haskell, superintendent, a force of about forty Igorot and Ilocano laborers being employed. The garden is approximately 1,500 meters above sea level and the climate like that of Baguio is delightfully pleasant.

The work of growing vegetables was undertaken at the Trinidad garden a few years ago on account of the scarcity of vegetable growers in and about the summer capital. During the past two years this work has reached the stage where it is an unquestioned success, and as a consequence many of the Igorots and Ilocanos are starting vegetable gardens of their own. Every morning one can see them at the hotels and cottages scattered over the hills with large baskets of vegetables to supply the tables of the many summer residents.

Among the vegetables which have been grown in considerable quantities are beans, beets, cabbage, carrots, celery, Swiss chard, sweet corn, cucumbers, eggplant, kohlrabi, lettuce, onions, parsley, peas, radishes, squash, tomatoes, turnips, mulberries, huckleberries, and strawberries. During the season of 1910 ₱200.40 worth of cabbage, ₱399.43 worth of beans, ₱436.87 worth of peas, ₱385.75 worth of tomatoes, and ₱702.84 worth of berries were sold. The vegetable crop alone sold for

₱4,098.68. Strawberries have been a very popular product. The sales of strawberries to April 15 of the present season amount to about ₱2,300, and the total sales of vegetables to about ₱4,300. There is every prospect that in a short time the commercial gardens will supply an abundance of vegetables to meet the demand for about eight months of the year and it is probable that the Government garden will soon be relieved of the work of growing vegetables and fruit for commercial purposes.

THE AGRICULTURAL BANK.

In a recent report Secretary Gregorio Araneta, of the Department of Finance and Justice, gave out the following statement on the operation of the Agricultural Bank of the Philippine Government since its organization:

The Agricultural Bank of the Philippine Islands was opened on the 1st of October, 1908. It was therefore in operation for only nine months during the fiscal year 1909. During the fiscal year 1910, 148 applications were made for loans, amounting to ₱497,574. The number of loans granted was only 89, amounting to ₱229,000. Five loans amounting to ₱7,200, were repaid. Delinquent interest on five loans amounted to ₱1,415.24. Three loans amounting in principal and interest to ₱14,045.24 were pending on foreclosure proceedings.

The total amount loaned by the bank at the close of the fiscal year 1910 amounted to ₱284,450, or approximately 28½ per cent of the bank's capital. Of this amount only 5½ per cent was placed during the fiscal year 1909, and 23 per cent during the fiscal year 1910.

Although the number of applications decreased considerably as compared with the nine months of the preceding year, when they amounted to 417, the number of loans made greatly exceeds the number placed for the previous nine months, during which time only 23 loans were granted. In other words, the number of loans made in 1909 were but slightly in excess of 5½ per cent of the number of applications received, while the number of loans made during the year 1910 amounted to 60 per cent of the applications received for the year. The increase indicates a clearer understanding on the part of the people of the purposes and requirements of the bank.

When it is considered that the creation of the bank was in response to a necessity felt by all agriculturists, and that the Government sought by this means to assist in the development of agriculture, it is somewhat discouraging to note the little business done by the bank. This is owing principally to the lack of titles to the greater part of the agricultural lands. It is hoped that with improved facilities for obtaining titles the Agricultural Bank will be better able to carry out the beneficent purposes of its organization. One of the good results already accomplished is the decrease of usury in the provinces.

The expenses of the bank during the year amounted to ₱1,204.84. The receipts amounted to ₱19,499.05. Deducting the expenses and the deficit of the previous year, amounting to ₱1,638.83, there remains a net profit of ₱16,655.88.

THE INCREASE IN GOVERNMENT REVENUE.

According to the financial reports from the different Bureaus for the first eight months of the fiscal year 1910-11 received by Governor-General Forbes there has been a net increase of revenue amounting to ₱1,700,000 over the same period of the fiscal year 1909-10. This increase of revenue is about evenly divided between the Bureau of Customs and the Bureau of Internal Revenue. The Governor-General states that while the increase is very gratifying it was not unexpected.

The total revenues of the Government for the fiscal year 1909-10, which were a little over ₱42,000,000 were divided as follows:

Customs	₱17,625,699.37
Internal revenue	10,231,734.44
Miscellaneous	11,230,955.36
City of Manila	3,014,284.99

THE BALANCE OF PHILIPPINE TRADE.

The following summary of the trade in the Philippine Islands for the year 1910 is given by the Hon. Gregorio Araneta, Secretary of Finance and Justice:

A comparison of the imports, valued at \$37,061,925, with the exports, valued at \$39,886,853, shows a balance in favor of the Islands of \$2,824,927, which increases the average annual net balance in favor of the Islands during the period of the American occupation to \$324,954. These figures include only the value of merchandise received through regular commercial channels and do not include the value of supplies and property imported by the Federal and Insular Governments, free entries on account of Government-aided railways, commercial importations of currency, and free mail importations, aggregating in all \$4,837,925. A large part of this privileged merchandise, consisting of cement, structural iron, and other material, has contributed to the general development of the business of the country, involving, as it does, the employment of labor in all parts of the Islands.

There were also exported to the United States, and not included in the foregoing figures, articles belonging to or carried in the baggage of outgoing passengers to a total value of \$54,553.

FRUIT EXPERT FOR THE BUREAU OF AGRICULTURE.

For some time the Bureau of Agriculture has had under consideration the matter of employing a fruit expert. It is believed that it is possible to supply a part of the demand for fruit in the Philippines which is at present supplied largely with fruit imported from the United States, Australia, and New Zealand. To this end the Bureau of Agriculture has been fortunate in securing the services of Mr. P. J. Wester, a tropical fruit expert from the United States Department of Agriculture.

Mr. Wester has for some time been engaged in experimental work at the Botanic Gardens in Miami, Florida, and only recently relinquished that work to take up this larger field of work in the Philippines. He is now engaged in making a study of various citrus fruits, such as oranges and lemons, mangoes and other tropical fruit. He hopes to bud and graft the superior varieties of oranges, such as navels and California sweets so as to convert the Philippine orange districts into producers of valuable fruit to supply home demand if not for export.

The larger part of the Philippine orange crop is such that it can be used only for local consumption. It is stated that during the past season more than three times the normal annual yield of oranges grown in the Batangas district were shipped out in about sixty days and it is estimated that the total crop shipped from this section amounted to about 10,000 tons. In case Mr. Wester is able to carry his experiments to a successful issue there is little doubt that the demand for Philippine oranges will be greatly increased and that it will be possible to build up a large trade in Philippine fruits in other parts of the Far East.

Mr. Wester states that during his work in Florida he found a mango known as the Manila mango which was more or less extensively grown by the Florida fruit growers. While he pronounces Philippine mangos by far the finest he has ever seen, yet he believes that they can be improved and suggests the introduction of the new seed-budding process for mangoes, which has been described by him in *The Porto Rico Agricultural News* for October, 1910.

NOTES FROM OTHER FIELDS.

MODERN SUGAR MILLS IN CHINA.

According to the Manila Daily Bulletin of March 28, 1911, an interesting report has been submitted by Mr. J. H. Arnold, the American consul of Amoy, concerning the erection of modern sugar mills in China that will be of interest to local sugar planters.

Mr. Arnold says:

A local Chinese business man, who has accumulated considerable wealth in various business and industrial enterprises in Java, is erecting two modern sugar mills, the machinery for which is being furnished by a Japanese firm, acting as agents for an American manufacturer of sugar-mill machinery.

Many years ago the Amoy hinterland produced large quantities of sugar cane, but the cane was allowed to deteriorate and the native methods of crushing were so crude and wasteful that the industry became unprofitable and was practically abandoned. The owner of these new mills has purchased large areas of land and proposes to use modern methods of growing and crushing the cane. The fact that \$15,000,000 has been invested in modern sugar mills in south Formosa during the past ten years, has encouraged the people of this district to believe that their sugar industry can be made equally profitable. Cane shoots from Formosa and Java are being imported. The bulk of the Formosa cane is the rose bamboo, which was introduced into Formosa from Hawaii.

RUBBER PLANTER'S ASSOCIATION IN COCHIN CHINA.

In order to insure more systematic development and make the rubber industry an important source of wealth for the colony, the principal rubber planters of Cochin China have formed an association, which is to meet at Saigon. According to the Journal d'Agriculture Tropicale, No. 115, this society which already represents large economic interests, will have for its object the improvement of the management of the agricultural and industrial exploitation of *Hevea* in Cochin China, and at the same time protect the interests of its members. At the monthly meetings it is planned to give an account of the work of the association and discuss any important questions that might contribute to the progress of the new industry. It is hoped that this organization will be encouraged by the administration and thus be better able to accomplish its work and make Cochin China an important rubber-producing country.

THE COPRA TRADE IN CEYLON FOR 1910.

Regarding the Ceylon copra trade the Tropical Agriculturist for February, 1911, publishes the following information:

The copra market throughout last year was well upheld, and the figures disclose an improving and firm position for estate owners and producers. The market began for the year with a fair number of arrivals which sold at R84.50¹ per candy² and this satisfactory opening was followed by a continued and steady tone, with prices occasionally attaining to the unprecedented high record of R93.50 per candy, while even the most common and inferior qualities rarely fell below R75 per candy, which at that time constituted a record. It will be readily seen that although fresh areas are yearly being brought under cultivation, the market remains active and there is a disposition on the part of buyers always to respond adequately to the added yield. The market gradually rose from January to the end of April when the record price for the year—R93.50—was obtained. Prices during May were also satisfactory, but then a slight depression was noticeable. About the middle of September there was a revival of the market; on the 12th of that month again parcels were purchased at R93 per candy. These high prices remained stationary, and the market met with continued support till the end of October, but slight indifference was shown by exporters during the two closing months of a prosperous year.

The unexpected rise in prices was due principally to the shortage of the supply occasioned by the severe drought experienced in coconut-producing areas—a drought which unhappily seems to recur with unpleasant frequency—while the increasing demand for nuts for making oil and for the desiccating industry have doubtless contributed toward it in some measure. The actual deficit in the export of copra for the year 1910 amounts to 363,327.09 kilograms (800,000 pounds); the high rate it would thus appear, is not warranted by the prevailing conditions in the copra trade alone, were it not that the exportation of desiccated coconuts has increased enormously, and the activity in the oil industry last year supplied the European and American markets with an output of over 2,744,245.11 kilos (6,000,000 pounds) in excess of the island's export of that commodity in 1909. With larger calls made upon the output of coconuts from these two fast-developing branches of the trade, it is no wonder that the market stood firm with prices which appear to have been so prohibitive that one or two countries withdrew temporarily if not altogether from competition.

While last year's figures compare very favorably with those of 1909, yet there appears to be a tendency among buyers who patronized the local market extensively in years gone by, to seek their supplies outside this colony. For instance, Russia during the year under review was so indifferent as to be satisfied with 7,076,507.05 kilos (15,500,000 pounds), whereas in the previous year she imported exactly double that quantity; Austria and Belgium, two extensive customers originally, also bought no more than half the number of tons they required in 1909; Denmark decreased her purchases by 452,592.09 kilos (1,000,000 pounds); our near neighbor, India, who appeared to be increasing her demand yearly and gave promise of providing

¹ One rupee equals ₨0.64888.

² Candy ranges from 500 to 560 pounds, about 4 piculs, 250 kilograms.

a convenient market for the product, has called for only one-third of her purchases for the previous year; Norway and Sweden have entirely abandoned their purchases.

The ports to which the largest quantities have been shipped during the year were Antwerp, Hamburg, Odessa, and Copenhagen. The countries which have imported more largely and have, in fact, substantially increased their demand are Great Britain, France, and Germany. Of these France has created an enormously inflated demand and has called for twelve times as much as her previous supply during the past twelve months, while Germany has taken twice as much as formerly imported. The island has found a new field in Holland, but this is evidently an experimental importation.

SUGAR MATTERS IN CUBA.

According to the Louisiana Planter, Volume XXXVI, No. 7, there has been a decided falling off in the sugar output for 1911. The total exports to January 31 are 142,217 tons as against 217,272 tons for the previous year showing a decrease or about one-third. The total stock in Cuba amounts to about one-half the amount of stock for the same date last year, thus indicating that the sugar which had been made was rapidly shipped out of the country. It is thought that these data put a serious aspect on the sugar situation in Cuba, as the shortages reported from nearly all the leading ports must have some foundation based upon weather conditions that have been inimical to the ordinarily expected conditions at this time of the year. The increase in the European sugar crop equal in quantity for the year now closing to the entire crop made by Cuba last year, would presumably dispel any hope for better prices that might be entertained on account of the present shortage.

MARKET REPORTS.

NOTES ON MANILA MARKETS FOR MARCH.

By KERR & Co.

(Based on advices from New York, February 20th; San Francisco, February 25th; London, March 2d; Cebu, March 25th; Iloilo, March 28th; Hongkong, March 28th.)

SUGAR.

Iloilo.—Market closes quieter, with sellers, no buyers, at ₱7.875 per picul No. 1, ₱7.375 No. 2 and ₱6.375 No. 3.

Manila.—We quote ₱6.75 per picul No. 1, ₱6.25 No. 2 and ₱5.50 No. 3.

Cebu.—Business has been done on a basis of ₱7.25 per picul No. 1, ₱7 No. 2, and ₱6.75 No. 3.

COPRA.

Quiet with buyers at ₱9.25 per picul Manila fair merchantable and ₱9.625 per picul Cebu fair merchantable sun-dried f. o. b.

HEMP.

Market quiet, we quote fair current for America ₱8 and for United Kingdom ₱7.50 per picul f. o. b. Values of better grades are also easier. Receipts at all ports for the three months are 329,771 bales against 302,879 bales 1910 and 305,165 bales 1909.

DISTRIBUTION OF PRINCIPAL PHILIPPINE EXPORTS FOR THE THREE MONTHS (JANUARY TO MARCH, 1911).

Products exported.	United States.	China.	Pacific Coast.	Great Britain.	Continent of Europe.	Australia.	Japan.	India and Singapore.
Dry sugar (tons) -----	5,500	8,550						
Hemp (bales) -----	110,180	2,950	13,170	104,432	23,732	6,010	6,581	2,575
Copra (piculs) -----	4,400		55,200	5,600	185,954		500	
Cigars (thousands) -----	1,483	8,313	4,008	3,153	2,214	1,838	287	8,569

MANILA AND LONDON FIBER MARKET.

Receipts and shipments of Manila hemp.

(Telegram from Manila to London, April 17, 1911.)

	1911	1910
Hemp receipts at Manila since January 1.....	<i>Bales</i> 317,967	<i>Bales</i> 277,583
Hemp receipts at Cebu since January 1.....	94,619	92,709
Hemp receipts at all ports since January 1.....	412,586	370,292
Shipments to United Kingdom by steamer, cleared since January 1.....	165,833	105,067
Shipments to Atlantic coast, United States, by steamer, cleared since January 1.....	119,843	141,771
Shipments to Pacific coast, United States, by steamer, cleared since January 1.....	32,998	35,770
Shipments to continental ports, by steamer, cleared since January 1.....	35,472	17,038
Shipments to all other ports.....	20,083	
and local consumption since January 1.....	3,000	
Loading steamer on the berth for the United Kingdom, about.....	23,083	19,037
Loading steamer on the berth for Atlantic coast, United States, about.....	5,000	30,000
		17,000

Bales of hemp loading for United States, by steamer *Hallamshire* 5,000

FIBER QUOTATIONS.

The following prices for Manila hemp, sisal, and maguey were quoted by Messrs. Landauer & Co., London, and Messrs. Sloan & Mitchell, of Manila, on March 1, 1911:

Manila hemp.—Fine marks have been in renewed demand, and orders cabled for very large quantities have met with little response, the scarcity of this particular grade becoming even more pronounced.

Spot and near hemp, has appreciated in value to a small extent, fair current in dock, and close by selling at £19 to £19 5s, and lower grades at £18 5s. to £18 15s.

Range of prices.

Grades.	London			Manila, per picul.
	Spot and close by.			
	Per ton.	Per ton.	Per picul	
Best marks -----	43/- to 46/-	£430.00-460.00	£26.90-28.75	
Good marks -----	41/- to 42/-	410.00-420.00	25.62-26.25	
Good current -----	35/- to 36/-	350.00-360.00	21.88-22.50	£15.60
25 per cent over current.	22/6 to 23/-	223.00-230.00	13.95-14.35	9.20
Fair current. -----	19/- to 19/6	190.00-193.00	11.88-12.10	7.60
Superior seconds -----	18/9 to 19/-	184.50-190.00	11.55-11.85	7.20
Good seconds -----	18/6 to 18/9	183.00-184.50	11.45-11.55	7.00
Fair seconds -----	18/3 to 18/6	181.50-183.00	11.35-11.45	
Good brown -----	18/- to 18/3	180.00-181.50	11.25-11.35	6.40
Fair brown -----	18/- to 18/3	180.00-181.50	11.25-11.35	

NOTE.—By comparing the above London quotations with those published in last month's issue it will be seen that on the beginning of March the price paid for medium and good grades advanced while that of the lower grades remained stationary.—EDITOR.

Sisal hemp.—No change to be reported. In New York the price remains $3\frac{1}{2}$ cents per pound, equal to £18 15s. to £19 for fair average quality and £19 15s. to £20 for selected quality per ton.

Manila maguey.—In better demand. Values £16 10s. No. 1, £15 No. 2, and £14 No. 3 per ton, corresponding to ₱10.30, ₱9.50, and ₱8.75 per picul, respectively.

The Manila quotations for the same date were ₱6.60 per picul for No. 1.

ILOILO SUGAR MARKET.

By FIGUERAS HERMANOS.

The sugar market during March has been decidedly quiet. The arrivals for the month amounted to 421,840 piculs, and only one shipment, that of March 14th on the steamer *Verona* destined for New York, containing 88,000 piculs, of superior sugar was recorded. The price on the first of the month was six pesos one and one-half *reales*,¹ with a gradual fall to 5 pesos $6\frac{1}{2}$ *reales* on the 5th. From the 9th there was a gradual improvement in the price to 6 pesos $3\frac{1}{2}$ *reales* at the close of the month.

Exports up to April 2, 1911.

	1909-10 crop.		1910-11 crop.	
	Superior.	Wet.	Superior.	Wet.
United States.....	272,800	-----	121,600	-----
China.....	64,575	-----	185,972	29.88
Total.....	337,375	-----	257,572	29.38

¹One real equals twelve and a half centavos.

PRINCIPAL PHILIPPINE IMPORTS AND EXPORTS— MARCH, 1911.

By the COLLECTOR OF CUSTOMS.

IMPORTS.

Articles.		Manila.	Cebu.	Iloilo	Totals
Rice	(Kilos)	5,731,215	6,772,342	3,874,117	16,377,674
	(Value)	\$177,737	\$235,738	\$131,096	\$544,571
Beef cattle	(Number)	2,589		200	2,789
	(Value)	\$47,026		\$4,971	\$51,997
Eggs	(Dozen)	371,115	42	83	371,240
	(Value)	\$30,961	\$4	\$9	\$30,974
Sugar	(Kilos)	164,761	25,723	19,352	209,836
	(Value)	\$11,066	\$2,053	\$1,324	\$14,443
Coffee	(Kilos)	11,679	1,503	877	14,059
	(Value)	\$4,262	\$842	\$246	\$5,350
Cacao	(Kilos)	85,681		402	86,083
	(Value)	\$21,437		\$88	\$21,525
Raw cotton	(Kilos)				
	(Value)				

EXPORTS.

Hemp	(Kilos)	10,874,488	2,411,116		13,285,604
	(Value)	\$1,032,122	\$269,214		\$1,301,336
Copra	(Kilos)	3,201,226	3,634,824	226,712	7,062,762
	(Value)	\$262,276	\$344,582	\$17,600	\$624,458
Sugar	(Kilos)	754,653		7,677,308	8,431,961
	(Value)	\$28,165		\$371,224	\$399,389
Cigars	(Thousand)	9,805			9,805
	(Value)	\$109,599			\$109,599
Cigarettes	(Thousand)	3,141			3,141
	(Value)	\$3,994			\$3,994
Tobacco	(Kilos)	922,364			922,364
	(Value)	\$127,299			\$127,299

TEMPERATURE AND RAINFALL FOR AGRICULTURAL DISTRICTS IN THE PHILIPPINES—MARCH, 1911.

By the DIRECTOR OF THE WEATHER BUREAU.

[Temperature and total rainfall for twenty-four hours beginning at 6 a. m. each day.]

Date.	Hemp.				Sugar, Iloilo.		Rice, Tarlac.		Tobacco.			
	Albay.		Tacloban.		Temperature.	Rainfall.	Temperature.	Rainfall.	Aparri.		San Fernando.	
	Temperature.	Rainfall.	Temperature.	Rainfall.					Temperature.	Rainfall.	Temperature.	Rainfall.
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
1	25.7		27		26		27.2		23.5	2.1	23.8	
2	25		25.9		25.7	0.3	26.17		21.5	4.3	22.9	
3	23.2	10.5	26	13.7	25.8		26.2		21.4		25.2	
4	25.3		25.5	.8	25.6		25.8		22.7		25	
5	25.8		25.5		25.5		26.2		24.3		25.6	
6	23.6		25.1		25.1		26.2		24.4		25.9	
7	25.1			.8	24.9		26.7		24.1		25.2	
8	25.5		25.6		25.3		25.8		24.3		26.7	
9	26.7		26.9		25.5		26		24.3		26.9	
10	25.1	2.5	25.4		25.8		26		24.6		26	
11	25	46.2	25.4	26	26.2	6.1	27.4		24.9	2.1	25.5	
12	27.1		27.1		27.5		27	1.3	24.8		27	
13	27.2	1	25.6	16.5	27.9		27.7		25.5		26.3	
14	27.4		26.3		27.1		28.5		25.8		26.6	
15	27.7		26.7	1	27.2		28		25.6		26.8	
16	27.4		26.5		27.6		28.8		25.8		27	
17	27.4		26.6		26.3	16.8	30.4	3.8	26.1		26.4	
18	27.2		26.9	6.4	27		29.8	.8	26		27.2	
19	26.7		26.9		26.8		29		23.7	.8	26.8	
20	27.5		26.2	21.8	26.8		27.8		23.9		28.2	
21	27	1.3	26.3	1	27.2		27.2		25.3		27.3	
22	27.7		26.6	1.6	27.2		27.8		25.5		27	
23	27.1		26.7		27.1		28		26.1		27	
24	26.7	5.6	25.8	1.3	27.2		29	9.1	24.2	.5	27.4	
25	26.9	13.9	25.7	4.3	27.3		26.9		23.8	1.5	26.8	
26	24.3	24.6	25.1	1.3	26.3		28		24.7		27.9	
27	25.4	20.5	24.7	13.5	26.6		27.8		25	.8	27.5	
28	26.2	10.4	25.2	26	27		28.1		25.1	2.3	27.7	
29	27.4		26.8		27.3		27.9		24.8		28.2	
30	27.4		26.9		26.5	4.5	27.8		24.6		26.7	
31	27.6		26.8	2.8	26.5		27.1		24.6		27	

THE PHILIPPINE *Agricultural Review*

VOL. IV

JUNE, 1911

No. 6

CONTENTS AND ILLUSTRATIONS.

CONTENTS.

	Page.
Editorial	277
The Development of Philippine Agriculture, by Prof. C. V. Piper, Agrostologist, United States Department of Agriculture.....	280
Certain Provisions of Law Concerning the Prevention and Suppression of Cattle Diseases (Executive Order No. 24).....	285
The College of Veterinary Science, University of the Philippines, by Dr Alvin Broerman, Instructor in Veterinary Anatomy.....	288
Government Scholarships in the College of Veterinary Science of the Philippine University (Act No. 2Q40 of the Philippine Legislature).....	291
New Theories on Soil Fertility, by O. W. Barrett, Superintendent of Experiment Stations	292
Executive Order No. 13	294
Form for Monthly Summary of Crop Conditions	295
Abacá (Manilla Hemp), Agricultural Extension Work Lecture No 3, by M. M. Saleeby, Fiber Expert	298
Statistics Regarding Sugar Cane and Tobacco in the Philippines. by W. D Hobart, Statistician	308
Mango Pests in Cavite and Rizal, by P. J. Wester, Horticulturist.....	312
Report on Tobacco Growing in the Island of Cebu, by R. W. Rowe, Tobacco Expert	315
Monthly Veterinary Reports—April and May.....	318
Monthly Crop Reports—April and May.....	320
Market Reports; Notes on Manila Markets, Manila Fiber Market, Iloilo Sugar Market..	326
Crop Statistics for the Quarter Ending December 31, 1910	328
Range of Prices of Philippine Agricultural Products for the Quarter Ending Decem- ber 31, 1910	331
Temperature and Rainfall for April.....	332

ILLUSTRATIONS.

PLATE I. Map Showing the Development of the Sugar Industry in the Philippines	309
II. Map Showing the Development of the Tobacco Industry in the Philippines.	311

EDITORIAL.

COLLEGE OF VETERINARY SCIENCE.

The article on the College of Veterinary Science, University of the Philippines, by Dr. Alvin Broerman, appearing elsewhere in this issue, comprises an announcement of the inauguration of an educational force of high importance to the development

of the Philippines. The prosperity of the Islands rests upon agriculture and agriculture in turn is dependent upon the existence of an abundant supply of work animals. In the Philippines, more than in temperate zones, is it necessary to safeguard the health of animals by a corps of veterinarians highly trained in the methods of preventing the dissemination of the infectious diseases of live stock.

It is an interesting fact that the ravages of rinderpest in western Europe in the latter half of the eighteenth century awakened the public to the necessity of state supported veterinary schools as a means of preparing trained men, properly to combat this cattle plague. A similar incentive has operated in the Philippines to establish what undoubtedly is the youngest of the state supported veterinary colleges. The hopes of the founders of the first veterinary college were realized by the utter extinction of the disease; the confidence in public education as a weapon against disease, cherished by the founders of the last veterinary college, is not misplaced.

The college opens a practicable way for Filipinos to secure adequate preparation to participate in this work of far-reaching importance. At present there is no graduate Filipino veterinarian in the Islands, although it is expected that one will return shortly from the United States with such a professional training.

The lack of properly educated Filipino veterinarians constitutes a weak point in the attack against existing disease. The present campaign is being directed by Americans, whose mode of thought and customs are as widely different from those of the people with whom they are dealing, as the East is from the West. Furthermore, the fact must be taken into consideration that they are separated from conversation with the great mass of stock owners by a chasm that frequently must be bridged by transmission of ideas through two or three languages.

Education of the individual stock owner as to precautions to be taken by himself ought to be made a potent factor in at least reducing losses from disease. In entirely analogous cases elsewhere, pests of agriculture have been by this means reduced to comparative harmlessness. Such individual action springing from knowledge of the facts governing the dissemination of disease, would create a situation favoring the prompt success of systematic measures of eradication instituted by the Government. It is with the hope of expediting popular education in matters of animal diseases and smoothing over the difficulties of disease eradication by developing trained Filipinos that the college is operated.

The College of Veterinary Science is aspiring to a standard of thoroughness of instruction that should justify its classification, in this particular, with the best veterinary colleges in Europe or America. In its requirement of attendance for five years of nine months each it immeasurably distances the standards of many institutions in the United States. Allowing for the fact that the first year of the five years may be regarded as preparatory, it may be classified as a four-year veterinary college, requiring a full high-school course for entrance, a standard by no means generally maintained in the United States.

During the first three years of the course the only subject taken at the buildings of the College of Veterinary Science is veterinary anatomy, the remainder of the time being spent in taking courses with medical students at the College of Medicine and Surgery, or special courses suited to the needs of veterinarians. This college of the university is, in equipment, faculty, and standards, easily in the front rank of medical schools. The close affiliation of veterinary and medical students enables the former to enjoy facilities for instruction rare, in any country.

MONTHLY SUMMARY OF CROP CONDITIONS.

Executive Order No. 13, and Bureau of Agriculture Form No. 38, published in this number of the REVIEW, provide for a monthly summary of crop conditions, to be furnished by the governor of each province. A summary of these reports will be furnished the daily press in Manila and the provinces, will be sent to the Bureau of Insular Affairs in Washington, and will be published in the PHILIPPINE AGRICULTURAL REVIEW. The original reports will be on file at the office of the Bureau of Agriculture, and will be available for use by any person interested in provincial conditions.

The object of a monthly provincial crop report is to furnish the general public, and more particularly industrial and commercial interests, with up-to-date information pertaining to agricultural conditions throughout the Islands. Quarterly statistical crop reports and semiannual statistical live-stock reports are valuable as a basis for the compilation of agricultural statistics, but they do not furnish certain current information for which there is a widespread demand, and which will be covered by the monthly reports. The blank forms for these reports are being distributed as this number of the REVIEW goes to press.

THE DEVELOPMENT OF PHILIPPINE AGRICULTURE.¹

By C. V. PIPER,

Agrostologist, United States Department of Agriculture.

It is with peculiar pleasure that I welcome the opportunity to address you to-day, you who represent the highest type of Filipino agriculturists. I can not of course speak with any intimate knowledge of your agricultural conditions and must therefore confine myself to certain general propositions connected with the development of your agriculture.

For the past eight years we of the United States Department of Agriculture have been watching the agricultural work here with much interest. Everyone who has returned to America has spoken in glowing terms of the great agricultural possibilities of the Philippines and has predicted that some day the agricultural output of the Islands would be a revelation to the world. One thing at least seems perfectly clear and that is that the prosperity and attendant progress of the Philippine Islands must come almost wholly from the soil. If this be true it follows that the highest duty of the Government is to stimulate agricultural development as rapidly as possible. Along with such development will come all other blessings and it is the only way to secure them.

This truth is elementary and fundamental, yet many fail to grasp it. No country in all history has ever reached a high status except on the foundation of a prosperous agriculture and no country that has allowed its agriculture to dwindle has long survived its decadence.

It is the recognition of this fundamental truth that has made the people of the United States so liberal and enthusiastic in all matters pertaining to agricultural progress. In no other country in the world is the farmer held in so high public estimation. The American recognizes clearly that the value of everything

¹ Address delivered at the agricultural conferences held in Manila from February 21 to 24, 1911.

else depends on the crops, and therefore more and more effort is being spent to assure their certainty and abundance.

The history of the development of agricultural research and of agricultural education in the United States, and the methods both have come to employ in the process of their evolution is worthy of the most careful consideration in determining the wisest course to be pursued here. That great progress has been made in America is beyond question. Nobody to-day denies it or even has any doubts on the subject. We have made mistakes of course, but most of these can in the light of American experience be avoided in the Philippines. After twenty-five years of agricultural research and agricultural education in the United States, we feel that we are just beginning to reap the greatest rewards from the work, and we look forward to the future progress being much more rapid than the past. That the crops of the United States can be doubled no one doubts, and but few question that they can be quadrupled. Optimists say they can be increased at least tenfold. Whatever the possibilities may be it is the high mission of agricultural research and agricultural education to develop them to the uttermost. If such possibilities still remain in American agriculture, think how great they are in these beautiful Islands where only one-fifteenth of your arable lands are in cultivation and most of that only for one-half of the year. I want to repeat that it is only by developing these enormous latent resources that the Filipino people can become rich and powerful. And this can by no possibility be brought about by some political *hocus pocus* as some dreamers profess to believe.

It is, I think, a very wise arrangement in the Insular Government that so closely allies agriculture and education. It assures unity of purpose and coöperation of effort. There are, however, some pitfalls to avoid. First of all you can't teach agriculture till you have it to teach. In the United States we now have twenty-five years' results in experimentation and a vast amount from other countries with comparable conditions. In the Tropics, agriculture is still in its infancy. It is true that the principles of agriculture are the same the world over, but such principles are general, and the man who is growing rice or sugar or tobacco or what not wants specific information. If he follows any advice or teaching he has a right to expect that his returns per acre will be increased or the cost per acre reduced. If such results do not follow he has a just grievance and your work becomes discredited.

There are just two ways in which definite knowledge con-

cerning any crop can be obtained, namely, experience and experimentation; on the one hand the results of the farmer, on the other of the scientific investigator.

It is no criticism of the Bureau of Agriculture to say that the experimental data on crops thus far secured is far too meager for educational purposes. At the outset the Bureau has devoted the bulk of its energies to the eradication of animal diseases. I think that under the conditions presented there can be little question as to the wisdom of this policy, as at the present time successful agriculture in the Philippines is largely dependent on farm animals. It therefore happens that as yet but little has been done in an experimental way to bring about the betterment of Philippine crops. It is unfortunate that ample funds were not provided so that experimental work with crops could proceed at the same time that the animal diseases were being brought under control.

In the meantime agricultural education has been introduced in all the schools and the teacher is struggling as best he can with a problem by no means simple or easy. It is the same problem that had to be solved in the United States. The success that has attended its solution there is ample proof that it was a wise movement, and in due time equal success will be attained here.

I have before said that there were two ways of securing knowledge about crops—one by experiment, the other by experience. It is only in late years that the value of the farmer's experience has been properly appreciated. Everywhere there are good farmers, bad farmers, and indifferent farmers. A careful study of the methods employed by each, and the results they obtain, frequently discloses the fact that they have solved problems of importance in the course of their experience. Such studies are being conducted in the United States more than ever before. In fact it is becoming to be regarded as fundamental to experimental work. One must know the different methods that farmers employ and the results that each secures, before he can really discern where the real problems lie. I mention this apparently obvious thing because it is almost the latest phase of agricultural study. I believe it will be found to apply here just as in the United States. Take the rice crop for instance. It is doubtless the case in the Philippines that the methods of handling the crop vary with the locality. Which of these methods is best? It will not do to assume that the local method must be best. It may be merely the result of crystallized tradition, but often a local method has some good reason for its use.

On the other hand it would be dangerous to assume that the method employed in South Carolina or Texas or Japan is superior. The wise thing to do is to study the different methods carefully and corollate them as far as possible with the results obtained. With this as a basis, critical experiments can be conducted to determine which is best. The important point is not to experiment until the native methods have been studied, and most important of all not to attempt demonstration work until there is an ample body of experimental proof of its correctness.

There are I am told 500 varieties of rice in the Philippine Islands. It goes without saying that some of these are better than others, but it is evident that a great amount of experimental work must be done before the very best can be determined. There is furthermore the chance that certain foreign sorts may be superior. It would be a mistake to endeavor to supplant a local variety until the evidence was ample that it really was inferior in yield or quality or both. Where a superior sort can be introduced it often means a large increase in yield and that without additional labor or cost to the farmer. The importance of such experimental work is therefore evident, and it is also clear that it requires time to secure reliable results.

I can not too strongly impress upon your minds that experimental work with crops is fundamental to agricultural progress, and such work can rarely be completed in less than five years' time. I mention this because in the early experience of American experiment stations there was an insistent public demand for immediate results. The effect of this too often led to the neglect of the most important problems, as these require time as well as ample facilities for their solution. The recognition of this fact will do much to further agricultural progress in these Islands, while on the other hand a demand for immediate results will lead to much premature publication and consequent harm.

I do not mean to imply that there is not a great deal that can be done at once on the basis of investigations that have been made elsewhere. This is certainly true of such crops as sugar, tobacco, coconuts, fruits, etc. I do mean, however, that it is necessary to repeat the experimental work that has been done elsewhere as well as to supplement it with investigations that pertain peculiarly to your conditions. As long as you keep your foundation on experimental work there can be no question as to progress, and any other method invites disaster.

Until late years there existed in the United States a gap between the work of the investigator and the work of the teacher

in agriculture. One was learning valuable things by investigations and experiments and the other was teaching them to his students, but after all only a little of this reached the farmer. This has been now corrected by the adoption of coöperative experiments with the best farmers and of demonstrations with the poorer farmers. After all most of us have to be shown that a certain thing is true before we will believe it, and I do not for one moment blame a farmer for not taking up every new thing proposed. If, however, you can convince him by a demonstration or experiment on his own farm that a certain method will give him an increased yield, he would be a very foolish man if he did not adopt it. If he does and the results continue good, his neighbors will soon do likewise. This is the method by which much agricultural educational work is now being done in the United States. You will note, however, that any work of this sort must of necessity have an adequate basis in experimentation, as otherwise many of the demonstrations would result otherwise than expected. It is a type of work that I feel sure will come to be largely employed here in the progress of agricultural education, but it would be unwise to attempt it prematurely; that is, before a sufficient amount of experiments had been completed.

I can conceive of no more interesting or more inspiring work than that of bringing into realization your magnificent agricultural potentialities. It is a work that requires well-equipped men and liberal material support, and you should be content with nothing less. In agricultural work particularly, continuity of effort is very important. It is poor economy not to hold good men when you get them, for if you do not you lose not only the man but also the benefits of his experience which a new man must have before he is of equal value, and good tropical agricultural investigators are scarce.

I feel sure that such an enlightened policy is the desire of the governing officials. It needs also, however, your earnest and constant support. With such a policy established there can be no doubt as to the outcome. The tremendously beneficial results that have resulted elsewhere from such a policy will surely accrue here and make these Islands famous for their agricultural products.

**CERTAIN PROVISIONS OF LAW CONCERNING THE
PREVENTION AND SUPPRESSION OF
CATTLE DISEASES.**

BAGUIO, March 31, 1911.

**EXECUTIVE ORDER }
No. 24. }**

1. The attention of all Insular, provincial, and municipal officials concerned is invited to the provisions of Act Numbered Two hundred and sixty-two,¹ providing for the interment or burning of the bodies of animals which die having rinderpest, and prohibiting the sale or use of any part thereof; of Act Numbered Eleven hundred and fifty-six,² providing for the marking of animals afflicted with surra, and of Act Numbered Seventeen hundred and sixty,³ making provisions to prevent the introduction into the Philippine Islands of dangerous communicable animal diseases, to prevent the spread of such diseases, within the Islands, and so forth. Copies of these Acts and of all rules and regulations governing the subject matters therein dealt with will be furnished in either English or Spanish on application to the Director of Agriculture, Manila.

2. The attention of all provincial boards concerned is called to the provisions of section thirteen (*k*) of Act Numbered Eighty-three,⁴ as amended by section six of Act Numbered One hundred and thirty-three,⁵ making it the duty of the provincial board to adopt, by resolution, regulations for the suppression of any agricultural pest like locusts or cattle disease, to provide for enforcement of the same by fixing penalty for their violation, and so forth.

3. The attention of all municipal officials concerned is drawn to the provisions of section thirty-nine (*m*) of Act Numbered Eighty-two,⁶ making it the duty of the municipal council to regulate the keeping and use of animals, in so far as the same affects the public health and the health of domestic animals, and to the provisions of section thirty-nine (*s*) of Act Numbered Eighty-two, providing that the municipal council shall adopt such measures to prevent the introduction and spread of disease as may, from time to time, be deemed desirable or necessary.

4. It is hereby made the duty of the municipal presidents im-

¹ 1 Public Laws, 638.

² 2 Off. Gaz., 413.

³ 5 Off. Gaz., 939.

⁴ 1 Public Laws, 142.

⁵ 1 Public Laws, 245.

⁶ 1 Public Laws, 110.

mediately to report, by wire, the appearance of any contagious disease, or any unusual number of deaths, among domestic animals, to the Director of Agriculture. A copy of such report shall also be sent to the provincial veterinarian or the nearest local representative of the Bureau of Agriculture, and the provincial governor.

Sick animals shall be immediately isolated in such locality so that they will not come in contact with other animals, people, or anything that may serve to spread the disease; guards shall be placed over them, and their former location shall be thoroughly disinfected to prevent the spread of the disease. Whenever an employee of the Bureau of Agriculture confirms a reported outbreak and notifies a president of a municipality that a contagious disease exists there and states that quarantine corrals are essential for the control of such disease, the president shall take the necessary steps to have constructed, in accordance with plans and specifications furnished by the Director of Agriculture, in such barrios as may be deemed necessary by the veterinarian, the required number of corrals to hold such infected animals as said veterinarian may order placed in quarantine.

Caretakers shall be placed in charge of each corral to feed and water the animals contained therein. No one else shall be allowed to enter the corral without having first obtained a pass issued under authority of the Bureau of Agriculture. Every person entering the corral shall be disinfected before leaving it.

When requested by the Bureau of Agriculture, presidents shall order all animals of the class designated by said Bureau to be assembled for inoculation or examination. Orders shall be issued that all animals of the class affected in an infected barrio be tied or confined and not allowed to run loose. Certain policemen shall be designated whose exclusive duty it shall be constantly to inspect the animals of the municipality and, when a contagious disease is declared to exist in a municipality by an employee of the Bureau of Agriculture, as many policemen as can possibly be spared should be detailed to assist in the eradication of the disease by maintaining quarantine and inspecting barrios. Orders should be given that the animals in an infected barrio should not be watered at a common watering place. Municipal officials are expected and directed to enforce such quarantines as may be prescribed by the Director of Agriculture.

5. It is hereby made the duty of the secretary of the municipality from which shipment of large animals is made by coastwise vessels to furnish to owners of such large animals, on demand, certificates as outlined in Customs Administrative Circular Numbered Six Hundred and twenty-two dated Novem-

ber fourteenth, nineteen hundred and ten, on forms prescribed by the Insular Collector of Customs and furnished by the Bureau of Customs.

6. It is hereby made the duty of all Insular, provincial, and municipal officials, upon receipt of information of the appearance of any contagious disease, or any unusual number of deaths among domestic animals in any municipality, immediately to report the same to the president of the respective municipality. The president shall forthwith investigate the matter, and if he shall find that a contagious disease has in fact appeared, or any unusual number of deaths occurred, among domestic animals in the municipality, he shall immediately report such fact to the Director of Agriculture, by telegraph, and send a copy of such report to the provincial veterinarian or the nearest local representative of the Bureau of Agriculture and the provincial governor.

Whenever an outbreak of contagious disease is confirmed and reported to the provincial governor by an employee of the Bureau of Agriculture, such governor shall immediately notify all municipal presidents in his province, stating the municipality or municipalities in which the disease exists and instructing them to adopt the necessary measures to prevent the introduction of any disease into their municipalities from the infected district.

7. Municipal presidents shall on receipt of this executive order prepare an accurate statement of the domestic animals in their respective municipalities, giving the name and address of the owner and the number of animals of each class, the location where they are kept, and the name and address of the caretaker when he is other than the owner. This list shall be made in triplicate, one copy to be placed on file, one furnished to the provincial governor, and one furnished to the Director of Agriculture or provincial veterinarian. These lists shall be revised subsequently every six months, on the first of January and the first of July of each year, and copies furnished as provided for above.

8. Failure to comply with the provisions of the laws, rules, and regulations, or executive orders governing this matter will subject the responsible official to administrative proceedings under Act Numbered Three Hundred and fourteen.¹

Executive Order Numbered Thirty-six, series of nineteen hundred and ten,² is hereby revoked.

W. CAMERON FORBES,
Governor-General.

¹ 1 Public Laws, 724.

² 8 Off. Gaz., 835.

THE COLLEGE OF VETERINARY SCIENCE, UNIVERSITY OF THE PHILIPPINES.

By ALVIN BROERMAN, D. V. M.,
Instructor in Veterinary Anatomy.

People who through business or prompted by travel are brought into the provinces of these Islands, see a vast expanse of green rolling hills and fertile valleys, uncultivated and but sparsely settled. Where are the herds that should graze and fatten upon these pastures? Or is the climate such that they can not thrive? These questions must arise when comparison is made with other countries similarly situated.

Here lies a country whose agriculture has been nearly paralyzed by the heavy losses of animals from disease. Agricultural prosperity is the necessary factor in the development of these Islands. A widespread financial disability is the great drawback. The prosperity of these Islands is dependent upon a body of trained men capable of coping with these prevalent destructive diseases of live stock. The prevailing ignorance among the people as to the nature, cause, and spread of these diseases and the methods that must be employed to eradicate them, hinders the work that veterinarians are now engaged in. The great contrast between the Oriental and the Occidental people brings opposition to this vital work, where the heartiest coöperation must exist in order to make it a success. Seeing the great need of educating men who through their environment are able to understand and enlighten these people, the First Philippine Legislature provided for the establishment of a College of Veterinary Science.

This College of Veterinary Science is one of the seven established colleges of the University of the Philippines and derives its origin from the Act establishing the university, of which the Rev. Murray Bartlett is president-elect. The Board of Regents had expected to open this college in 1909, but later the opening was postponed in order to allow sufficient time for the completion of the necessary buildings. The college was opened to students

during June, 1910, when a veterinarian from the Bureau of Agriculture was detailed to start this work.

Veterinary medicine has made wonderful advancements in the last half century, particularly in Europe where the degree of doctor of veterinary medicine is recognized as a token of high scientific accomplishment. To obtain the highest degree of efficiency from graduates, it is essential that they possess a good preliminary education. The entrance requirements for admission to this college have been placed at eighteen units, in which four years of English, one and one-half years of algebra, one year of geometry, two years of general history, one year of United States history, two years of Latin or Spanish, one year of physics, one year of botany, one-half year of physical geography, one-half year of physiology, one year of economics, and two and one-half years more of elected subjects are required. A unit is considered to be a subject which meets for one period a day, five days a week, throughout one school year.

The study of veterinary medicine according to the common acceptance of the term, is to gain by attentive consideration a thorough knowledge of the external form as well as the internal structure of our domestic animals. It includes the study of the nature, cause, and the appropriate treatment of their disorders, and through sanitary methods to exterminate infectious and contagious diseases. In order to consider in detail every phase of the wide field of veterinary and sanitary science, it can easily be understood that the five years of work given in this course are indispensable.

On account of the similarity in subjects in the two courses, a large part of the first three years' work of veterinary students will be done in the College of Medicine and Surgery. This is a well-established institution, which prior to its affiliation with the University of the Philippines was known as the Philippine Medical School. Many high schools throughout the Islands giving the four years of work, are found deficient in zoölogy and physics, and with but a few exceptions do not teach chemistry. To avoid students from being handicapped through this condition, it has been decided to include these subjects in the first year of the course in veterinary medicine.

The college buildings consist of three reinforced-concrete buildings, located near Pandacan, adjoining the quarantine yards of the Bureau of Agriculture. This group furnishes at present the laboratory and class-room facilities for the instruction in comparative veterinary anatomy.

A recent appropriation of ₱3,500 has been made to be used

for scholarships in this college. These are to be distributed among capable, energetic students who through the lack of means could not otherwise take up this course.

The Board of Regents was very fortunate in obtaining as the dean of this college the chief veterinarian of the Bureau of Agriculture. Dr. Archibald R. Ward is a man widely known in the veterinary profession and through his experience gained by teaching veterinary subjects, he will be able to give such advice as is necessary to bring about the development of this institution.

There are no graduate Filipino veterinarians at present and only a few private practitioners of veterinary medicine in the Islands. Every province should have young men desirous of taking this course that it may prepare them to become an important factor in the development of animal industry in their home communities. The financial returns possible in stock raising should be treated with attention, as not only are the potential resources sufficient to produce enough meat for local consumption, but for exportation as well.

The small number of students studying veterinary medicine at present gives excellent opportunity for individual instruction. The facilities for giving instruction are ample and the close coöperation of the Bureau of Agriculture gives students opportunity to study the work of disease eradication carried on by this Bureau.

**GOVERNMENT SCHOLARSHIPS IN THE COLLEGE
OF VETERINARY SCIENCE OF THE
PHILIPPINE UNIVERSITY.**

(Second Philippine Legislature, first session Assembly Bill No. 513—Act No. 2040)

An Act to appropriate the sum of three thousand five hundred pesos for the creation of Government scholarships in the College of Veterinary Science of the Philippine University.

By authority of the United States, be it enacted by the Philippine Legislature, that:

SECTION 1. Twenty-five Government scholarships for Filipinos are hereby created in the College of Veterinary Science of the Philippine University, to be filled subject to rules prescribed by the Board of Regents of said university: *Provided*, That there shall not be more than ten of these scholarships for the first year of the said college.

SEC. 2. The sum of three thousand five hundred pesos is hereby appropriated, out of any funds in the Insular Treasury not otherwise appropriated, to carry out the provisions of this Act mentioned in the preceding section during the first year.

SEC. 3. The public good requiring the speedy enactment of this bill, the same shall take effect on its passage, in accordance with section one of Act Numbered Nineteen hundred and forty-five of the Philippine Legislature.

Enacted, February 3, 1911.

NEW THEORIES ON SOIL FERTILITY.

By O. W. BARRETT,

Superintendent of Experiment Stations.

To the planter who has followed the recent great change in the attitude of soil experts as regards what constitutes real fertility of soil, who has an eye on the future methods, problems, and plans for the economic development of his fields—i. e., the feeding area of the world's population—and who is eager to get to the bottom of the intensely interesting and scientific facts with which he is struggling day by day, the following quotation from a recent bulletin (No. 34) of the Hawaiian Sugar Planters' Association experiment station will have considerable value, giving as it does practically the whole length and breadth of the science of soil management in a highly concentrated, yet accurate and appetizing form:

The biological viewpoint of the soil has now become as thoroughly accepted as was the chemical some decades ago. The soil can no longer be looked upon as a nonliving mass merely furnishing a mechanical support to roots of plants and acting as a carrier of moisture and dissolved nutrients to them. All the improvements from the usual practices of good husbandry, such as cultivation, drainage, fertilization, green manuring, etc., are largely explainable by their respective and collective beneficial actions on the teeming millions of microorganisms inhabiting the soil.

The soil can be regarded from several viewpoints, a recent publication dividing them into (1) physiographical (regarding origin), (2) chemical (as a purveyor of plant food), (3) physical or mechanical (as a medium for the transmission of moisture and plant food), and (4) biological, from which viewpoint 'a soil is a more or less weathered rock detritus commingled with organic matter, wherein microorganisms, mostly bacterial in their nature functionate, transforming raw materials into available plant food, reducing relatively complex molecules of animal and vegetable origin into simpler forms suitable to plant nutrition.' Soil fertility, which to the chemists means the maintenance in the soil of conditions necessary for providing the necessary mineral nutrients or their introduction therein from artificial sources; to soil physicists, the optimum mechanical conditions suitable for root development, drainage, and moisture conservation; to later investigators, the elimination of toxic excretions from the growing crop, means to the soil bacteriologist the maintenance of those conditions of

drainage, aëration, nutrition, and reaction which will react most favorably on the development of beneficial soil organisms, and the introduction into the soil, when necessary, of such organisms as are essential to the growth of particular plants.

Bacteria are divided into two general classes; aërobic, or air-loving, and anaërobic, or those developing only in absence of air. Between these two classes are found those which can adapt themselves to either conditions, termed facultative aërobic or anaërobic. Again, both types may flourish together, the aërobic, by withdrawing the oxygen from the soil air furnishing a suitable atmosphere for the anaërobic organisms. In agriculture, however, the conditions of tilth furnish the conditions best suited for aërobic bacteria, and for the purpose of soil investigations these are the only ones requiring close study.

As long ago as 1850 it was a matter of common knowledge that crops of the Leguminosæ family contained more nitrogen than was supplied to them as fertilizer or removed from the soil, but it was not until 1886 that the researches of Hellraigel and Wilfarth established the connection between this increase and the synbiotic fixation of nitrogen from the atmosphere by the plant and bacteria found in the nodules of the roots, named *Pseudomonas radicola*. The final test of the presence and activity of these organisms in a given soil is the development of the characteristic tubercles on the roots of a plant of this family when growing in the soil, and this does not come strictly within the scope of a biochemical examination of the soil. In connection with these particular organisms, it has been found that when the leguminous plant has failed to develop the root-nodules, other conditions such as tilth, reaction, etc., of the soil being favorable, the absence of the bacteria peculiar to the host plant is demonstrated. The soil can be then inoculated either by the necessary pure culture of the organism needed; or better, by supplying the organism by adding soil from a region where the successful development of the plant in question has shown the presence of the desired organism.

In reference to other bacteria of the soil, however, the problem of inoculation has not yet been worked to a successful conclusion. As a matter of fact, all the organisms necessary for the transformation of nitrogen in the soil are present, in varying numbers and proportions, in all arable soils. Their numerical or potential proportions, however, as well as the correct condition of moisture, temperature, chemical and mechanical conditions of the soils, and the presence of larger organisms, are not always favorable to the development of the most beneficial species. It is by altering or assisting these conditions that the present status of the chemico-bacteriological investigations of soils can serve its most useful purpose toward agricultural economy. Additions of antiseptics, such as carbon bisulphide, thorough aëration and exposing to the heat of the sun, and burning off the surface of fields have produced favorable crop results which can be largely attributed to changes in the bacterial flora of the surface soil. Improving the drainage; altering the mechanical conditions of the soil by addition of such amendments as lime, lime carbonate, or gypsum; correcting soil acidity by lime salts; increasing the humus content of the soil by plowing under green crops or addition of stable manure; addition of fertilizers supplying necessary mineral nutrients—all find a partial answer as to the reason of increased crop returns in their respective effects on the beneficial organisms of the soil.

EXECUTIVE ORDER NO. 13.

THE GOVERNMENT OF THE PHILIPPINE ISLANDS,
EXECUTIVE BUREAU,
Manila, February 28, 1911.

EXECUTIVE ORDER }
No. 13. }

The provincial governor of each province organized under the Provincial Government Act (No. 83) and under the Special Provincial Government Act (No. 1396) is hereby authorized and directed to forward to the Bureau of Agriculture promptly on the first of each month a brief report on crop conditions in his province for the preceding month, and the Director of Agriculture is hereby instructed to compile such reports for publication in the Philippine Agricultural Review and for distribution to the English and Spanish press published in the Philippine Islands. The Chief of the Bureau of Insular Affairs, War Department, Washington, District of Columbia, will also be furnished a copy of the reports thus compiled by the Bureau of Agriculture.

Provincial governors will be furnished the necessary forms by the Bureau of Agriculture.

W. CAMERON FORBES,
Governor-General.

FORM FOR MONTHLY SUMMARY OF CROP CONDITIONS.

DEPARTMENT OF PUBLIC INSTRUCTION.
DEPARTAMENTO DE INSTRUCCIÓN PÚBLICA.

BUREAU OF AGRICULTURE.
OFICINA DE AGRICULTURA.

MONTHLY SUMMARY OF CROP CONDITIONS.
BREVE INFORME SOBRE EL ESTADO DE LAS COSECHAS.

(Province.)
(Provincia.)

(Month covered by report.)
(Mes á que se refiere el report.)

1. A brief statement regarding the work that has been done with this crop during the month (planting, harvesting, etc.).

Un informe breve sobre el trabajo que se ha hecho con esta cosecha durante el mes (siembra, recolección, etc.)

2. A brief statement of any damage that has been done to this crop during the month by insects, plant diseases, or unfavorable weather conditions.

Un informe breve de cualquier daño que haya sufrido esta cosecha durante el mes á causa de insectos, enfermedades de las plantas, ó condiciones desfavorables del tiempo.

3. The local price of product in the provincial capital on the last day of the month, in metric unit of weight or measurement.

Precio local del producto en la capital de la provincia el último día del mes en unidades métricas de peso ó medida.

4. Remarks on the general condition of this crop throughout the province.

Observaciones sobre el estado general de esta cosecha en toda la provincia.

Rice. (In quoting price state whether it is for paddy or cleaned rice).....

Arroz. (Al fijar el precio dígame si se trata de palay ó de arroz limpio.)

Abaca

Абзацъ.

Coconuts. (Quote price of copra, coconuts, oil or tuba depending upon how product is marketed).....

Cocos. (Fijese el precio de la copra, cocos, aceite ó tuba, según la forma en que se venda el producto.)

Sugar cane. (When marketed in panochas give price by weight)

Caña dulce (Cuando se venda en forma de panochas, desde el precio según el peso.)

Tobacco

Tabaco.

Corn. (Quote price per liter and state whether it is on the cob or shelled).....

Maíz. (Dése el precio por litro y hágase constar si es en mazorcas ó desgranado.)

Other important crops

Otras cosechas importantes.

JUNE, 1911.

297

BRIEF OF B. A. FORM NO. 38.

MONTHLY SUMMARY OF CROP
CONDITIONS.

Municipality of

Province of

Month of, 191

RECEIVED IN BUREAU OF AGRICULTURE

....., 191

ABACÁ (MANILA HEMP).—AGRICULTURAL EXTENSION WORK LECTURE No. 3.¹

By M. M. SALEEBY, *Fiber Expert*.

INTRODUCTION.

The object of this lecture is to invite attention to some of the more important matters connected with the abacá industry in the Philippine Islands. The importance of this industry is probably well understood by everyone present, and it is because the growing of abacá and the preparation of this fiber for the market is such an important industry that every effort should be made to make it a profitable one.

There are two agricultural products that are of supreme importance in the Philippine Islands. These two products are rice, which is our great food staple; and abacá, which brings into the Islands more than thirty million pesos each year. I do not mean to say that other products, such as sugar, tobacco, copra, and maguey, are not also of great importance, but first of all are rice and abacá. More than half of the money that comes into the Philippine Islands each year is the money that is sent here to buy abacá. It is easy, therefore, to understand why a large crop of abacá that sells for high prices means prosperity and comfort, while a small crop and low prices means hardship and want throughout many provinces and to many thousands of our farmers. In this lecture I shall try and suggest to you some ways by which we can produce a larger crop of abacá, and also a better quality of fiber that will bring higher prices in the markets than you are receiving at the present time.

You are all familiar with the plant which, in the Philippine Islands, is called either abacá or lanut, and the fiber that is known as abacá. In the United States and Great Britain this fiber is known as Manila hemp, manila, or hemp.

¹ The agricultural extension work lectures are elementary papers intended, primarily, for lecture work in the provinces.

SELECTION OF VARIETIES.

There are many varieties of abacá under cultivation in the leading abacá districts, and often six or seven of them (sometimes more) are found growing in one locality. The principal differences among the abacá varieties are in color, size, and shape of the stalk; in the quantity and quality of the fiber; in the tendency to produce suckers; and in the degree of hardness of growth. Some varieties of abacá are much more profitable to grow than others. It is thus apparent that a thorough knowledge of the different varieties of abacá and their characteristics is of extreme importance to all prospective planters.

The qualities that must be considered in selecting desirable varieties for starting a new plantation are large and rapid growth, abundance of fiber of good quality, and facility of extracting the fiber. Heretofore the abacá plant has been propagated indiscriminately, with the result that many inferior varieties are continually propagated and can be found growing in almost every abacá plantation in the Islands. Laborers are, as a rule, the best judges of varieties. They are averse to stripping inferior varieties, and when labor is scarce it has been found wise not to force them to do any work which they justly claim does not give them due compensation. For a comprehensive description of the most common varieties of abacá that will enable you to select seed of desirable quality, I refer you to Farmers' Bulletin No. 12 on "Abacá (Manila hemp)" and to the report of the Director of Agriculture for the fiscal year 1910, which is published in the January number of the PHILIPPINE AGRICULTURAL REVIEW, 1911. Both of these publications can be obtained without cost by writing to the Director of Agriculture, Manila, P. I.

CLIMATE.

The climatic conditions that determine the possibility of successfully raising the abacá plant are amount and distribution of rainfall, temperature, atmospheric humidity, and prevalence of strong winds. Rainfall must be abundant and evenly distributed the year round; for a drought of two or three weeks will considerably retard the growth of the plant, while one of a longer duration is always followed by fatal results. The degree of temperature must neither be too high nor too low, for the one increases the evaporation of moisture from the soil and the broad leaves of the plant, and the other interferes with the function of its different organs. A high degree of atmospheric humidity is necessary for the best growth of the plant, especially in those locations subject to frequent spells of dry weather.

The prevalence of strong winds is ruinous to the abacá plant, for its broad and heavy leaves may easily be injured by them. In all locations subject to such strong winds the abacá must be well protected by large trees, planted at regular intervals, which will serve to break the force of the wind.

SOIL.

The three kinds of soil in which abacá thrives best are, in order of superiority, the alluvial plains subject to overflow by rivers or mountain streams, the moist mellow loams formed by the disintegration of volcanic rock, and other well-drained loams. One or more of these three kinds of soil are found in every district where abacá is successfully grown, and they are invariably found to possess a large quantity of humus. Denuded soils, or soils from which all humus has been washed away, are not, as a rule, suitable for growing abacá, unless humus can be supplied in one form or another. Cogon lands afford an example of denuded soil.

Dry sandy soil such as is found along the sea beach, stiff clay loams, rocky limestone soil, and water-logged soil should be avoided. An attempt to transform these inferior soils into proper condition, either by plowing, irrigating, draining, or fertilizing, as the case may require, usually entails too much expense and labor to make such operations practicable.

The "lay of the land" has a great deal to do with the successful cultivation of abacá. Other conditions being the same, steep hillsides are not as favorable as the adjoining level land.

PROPAGATION.

There are two common methods by which the abacá plant is propagated. The first is by use of the rootstocks, or the underground part of the stalk; and the second by the use of the shoots, or suckers.

The use of the rootstocks is the more desirable method for starting a new plantation, because they are more liable to grow, easier to handle, and retain their vitality for a longer period than the suckers. The rootstocks are set out entire, if they are small; but, if they are large, they are usually cut into two or three sections. Cutting the rootstocks in this manner results in producing healthier and more luxuriant plants than when planted entire, and also reduces, by one-half, the number of rootstocks required.

The use of shoots or suckers in propagating abacá is probably the most general method. Healthy and well-developed shoots only should be selected. This method, however, has two draw-

backs; first, it is impracticable to transport shoots a long distance without injuring them in some way; second, a large percentage of them will fail to take root, especially if they have to be transported long distances. This method, however, can be recommended in replanting in a field where some of the rootstocks have failed to come up.

PREPARATION OF THE SOIL.

The first process in preparing the land for planting is the clearing of forest. The land should first be cleared of all weeds, underbrush, and small trees. The material that is cut should be left scattered on the ground until perfectly dry, when the felling of the large trees should commence. After felling the large trees it is advisable to cut off all branches and limbs. If this is done the waste material will dry more quickly and will be more thoroughly consumed when burned. Three, and sometimes more, burnings are required before the soil is sufficiently clean to allow of easy and systematic planting. The clearing of forest should not be started until about the middle of the dry season, and it will take the balance of the season to have the soil prepared and the plants set out. If clearing is started at the beginning of the dry season, the trouble and expense of thoroughly burning the timber would be great, and the plants will have to be set out at least six weeks before the rainy season is on, causing a large number of them to fail to grow. In case of planting on a large scale, however, it may be necessary to begin clearing early in the dry season.

Ordinarily, it is almost impossible to plow the soil preliminary to planting on account of the large number of trunks of trees of all sizes that cross the field in all directions. Therefore, to keep down the growth of weeds and grasses, resort must be had to planting some kind of vine that will serve to kill the weeds and, at the same time, furnish food for the laborers. Camotes are generally planted for this purpose, but various other plants, preferably legumes, will serve the purpose. Such plants, however, must not be planted until after the abacá plants are at least a foot high.

PLANTING.

Immediately after preparing the soil planting should begin. The time should be the end of the dry season. The distance the plants are set apart ranges from 3 to 3½ meters. This will give from 1,250 to 850 plants to the hectare.

The lining should be made with a chain or a cord. The former is preferable, as it will not shrink when subjected to moisture.

It is very important that the rows be straight in order to allow of proper cultivation during all stages of growth and to prevent the intermingling of the hills as a result of their natural tendency to spread out as they grow old.

The hole should be large enough to receive the rootstock and leave a space of about 10 centimeters all around to be filled in with the soft earth dug out. This will give a good start for the tender roots of the young plant. The rootstocks should be put erect in the hole with the stalk end up. The hole must not exceed 25 to 35 centimeters in depth, depending on the size of the root to be planted.

CULTIVATION.

To keep down the growth of weeds before the abacá plants have had time to shade the ground, most of the planters, if not all of them, plant camotes; and the only cultivation that the plants receive at this time is to keep the soil open and loose immediately around each plant. With this method, however, it will be necessary to go over the plantation once every two months during the first year. During the second and third years hardly any cultivation of this nature is needed, as during this period the plants shade the ground and stop the growth of weeds as well as that of the camotes. After the end of the third year three or four cleanings a year will be required, as by that time a number of stalks of each hill will have been harvested and the hills opened, exposing the soil to the rays of the sun, which causes many kinds of weeds to spring up.

Cowpeas, velvet beans, mongos, and various other leguminous plants instead of camotes can be cultivated with abacá to great advantage. These plants, besides yielding valuable food products, enrich the soil with nitrogen, which element is essential to the growth of abacá.

The cleaning of weeds can be better and more economically accomplished by the use of hoes instead of bolos. Whether cleaning is done by hoes or bolos the laborers must be very carefully watched while they are doing the work, as there is always danger of their injuring the young shoots, and they are liable to move the soil away from the plants, which will in course of time expose a large part of the rootstocks. After the soil immediately around the plants is loosened and freed from all weeds it must be pressed around the hill in order to prevent it from washing away.

If the clearing of forest is accomplished as previously indicated, the soil ought to be fairly clean of timber after the third

or fourth year, and modern cultivators can then be used for cultivating the soil. The modern methods of cultivation are more economical than the ordinary native methods, and will result in improving the quality of the fiber and rendering the plants capable of standing longer periods of drought.

HARVESTING.

The abacá plant when mature consists of a group of twelve to thirty stalks. These stalks are in all stages of development, but usually two to four only can be harvested at the same time. The stalk is mature at the time of the appearance of the blossom, or shortly before. As a rule no cutting should commence before the plant is two to two and one-half years old. After the first harvest subsequent cuttings can be made every four to six months.

The manner in which the stalks are harvested affects considerably the life and welfare of the plant. Owing to the fact that the stalks of an abacá plant, especially young plants, are crowded together and tied to each other by their old dry leaves, great care should be exercised in felling the mature ones. If the laborers are left to themselves they will cut off the mature stalks at the bottom and allow them to fall, quite often bringing down with them or tearing off the leaves of some of the immature stalks. The continued practice of such careless cutting is bound to result in serious damage to the plants. To avert such damage the men should be trained to cut down the stalks in a proper way. These men should be furnished with a long pole having a sharp knife attached to it at the top, with which the top of the stalk immediately under the base of the whorl of leaves, and also all the dry leaves tying it to the adjoining stalks, are cut off. The stalk, being left separate, can then be cut down with a bolo or any knife having a sharp blade. The cutting should be made 5 to 7 centimeters from the crown of the rootstock and on a slant, so that water will not collect on the stump and cause it to rot and injure the root before the young shoots have had time to develop roots of their own to supply them with the required nourishment.

Another grave mistake is often made in harvesting the abacá plant. Owing to pecuniary difficulties or to mere ignorance, some planters overcut the plants, leaving only the young shoots. This method is ruinous to the plant. It opens the hill too much to the sun, increases the growth of weeds, shortens the life of the plant, and reduces considerably the total output of fiber.

EXTRACTION OF FIBER.

The abacá stalk ranges from 2 to 7 meters in length and from 15 to 45 centimeters in circumference at the base. It consists of overlapping leaf sheaths from the outer layer of which the fiber is obtained.

The common method of allowing the strippers to work in any part of the field they choose and in any manner they desire has been one of the chief causes of the production of inferior fiber and the consequent decline in prices. The disadvantages of the above method may be summed up as follows: First, the overseer can not watch the work of the strippers as often and as closely as necessary; second, the strippers when left to themselves prefer to cut the large stalks only, or the stalks of certain good varieties, leaving out the small stalks and omitting the plants of inferior varieties; third, the strippers have no interest in turning out a superior grade of fiber, and are often seen to leave the strips lying out in the field exposed to the sun and rain until they turn yellow; fourth, the strippers often reduce the tension of the knife upon the block of wood so as to make it much easier to pull the strips; and fifth, they work at their leisure, starting and finishing work at their convenience.

The following method will serve to remedy all the defects and disadvantages of the above method of extracting the fiber: A long shed should be built at a spot as near the center of the plantation as possible, under which all strippers should be made to set up their knives and adjust them to the satisfaction of the proprietor or overseer. A gang of men well trained in felling the stalks and separating the strips should be employed under a competent overseer, while a few boys with carts and carabaos or cattle can haul the strips from the field to the shed and turn them over to the man in charge, who in turn distributes them to the men under him. A few more boys should be with the strippers in the shed to receive the fiber immediately after it is stripped and spread it to dry on the lines of wire stretched outside the shed. During rainy weather, however, similar wires should be set up under a shed, where the fiber should remain spread until it is perfectly dry. Under no circumstances should the hanks of wet fiber be left unspread, as the fiber will then be sure to sweat and discolor.

By adopting the above method four advantages will be gained: First, the field is harvested in one uniform way throughout; second, the hills are better handled and every mature stalk in

them, whether large or small, is harvested; third, more work is gotten out of all laborers, due to division of labor; fourth, sickness among laborers is reduced, as they are not any longer exposed to changes of climate, such as heat, wind, and dampness, as they are when working out in the field.

YIELD OF FIBER.

The yield of fiber varies greatly, depending on soil and climatic conditions, the use of modern methods of cultivation and fiber extraction, the selection of varieties, irrigation, and careful management. From 375 to 2,500 kilos (6 to 40 piculs), or even more, can be obtained per hectare; but an average of 1,000 to 1,250 kilos (16 to 20 piculs) is considered a good yield. The average yield throughout the Islands does not exceed 400 kilos (6½ piculs) per hectare.

QUALITY OF FIBER.

Softness, color, and strength are the qualities usually considered in grading abacá fiber. The degree of softness, color, and strength is affected by soil and climatic conditions, by the variety cultivated, by the position of the sheath in the stalk, and by the manner of extracting, drying, and handling the fiber.

The fiber increases in softness and whiteness from the outside sheaths toward the inner ones, those around the core being the softest and whitest. After every four or five sheaths we invariably find a noticeable change in the quality of the fiber. Given from 16 to 25 sheaths to the stalk, the position of the sheaths will in itself be responsible for only four or five grades of the fiber. But, owing to the imperfect method of extracting the fiber and the lack of care in handling it prior to and after extraction, we find as many as 17 grades in the market, the lowest five or six of which have no reason to exist.

The following are the standard grades of abacá fiber as known in the United States and European markets, which for convenience I shall place under four groups:

- I. Best marks, or F. E. A. quality, consisting of 300 per cent, 250 per cent, and 200 per cent over good current.
- II. Good marks, or F. E. B. quality, consisting of 150 per cent, 100 per cent, and 50 per cent over good current.
- III. Middle marks, or grades, consisting of good current, 75 per cent over current, midway, and 25 per cent over current.
- IV. Low marks, or grades, consisting of current superior seconds, good seconds, fair seconds, good brown (red), fair brown (red), and Daet current.

The present prices (February 1, 1911) paid for the above grades in the London market are as follows:

- I. Ranging from ₱26.25 to ₱27.50 per picul.
- II. Ranging from ₱25 to ₱25.65 per picul.
- III. Ranging from ₱14 to ₱22.50 per picul.
- IV. Ranging from ₱11.25 to ₱11.85 per picul.

The grades that make up Group IV should not exist, for they are caused by improper extraction of the fiber and by lack of care in handling it. If the fiber is properly extracted and handled it should average in Group II. The Bureau of Agriculture has conducted a series of fiber extraction experiments, using entirely the ordinary methods. In every case, the fiber turned out averaged at least 50 per cent over good current, or six grades above the general average, while the waste ranged between 8 and 10 per cent more than that obtained in turning out much inferior grades. The results of those experiments are confirmed by the planters of the Davao district, who, according to the last reports received from them, are selling their product at prices ranging between ₱15 and ₱16.50 per picul on their plantations. Their fiber, to command such a high price, must average, according to the present Manila quotations, 50 per cent or 100 per cent over good current. There can be no reason whatever why planters in the other abacá districts should not be able to produce the same grades and receive the same prices.

RENEWING OF OLD PLANTATIONS.

The life of the abacá plant varies from twelve to twenty years, depending on the adaptability and fertility of the soil and on the extent of care and cultivation given to the plant. Heavy soils, lack of cultivation, carelessness in felling the stalks, and the frequent digging up of roots all tend to shorten the life of the abacá plant.

In the provinces where the cultivation of abacá has recently been started, the method of renewing old plantations has not, as yet, been given any consideration. In the Provinces of Albay, Leyte, Sorsogon, etc., where abacá has been grown for years, the common method of renewing the plantations consists in digging up shoots of old plants and in planting them in the intermediate spaces. This system is wholly undesirable, and the plants thus reproduced are, for obvious reasons, neither so healthy nor so productive as the original ones.

Every year a part of the old plantation should be plowed to a depth of 15 to 20 centimeters and a crop of corn or rice raised on it. After the crop is harvested all that is left of the corn or

rice plants should be plowed under. After these operations the abacá rootstocks can be set out as in the first planting. Cleaning with bolos should be done away with now, and the successive operations of cultivation and interplanting of leguminous crops resorted to to kill the weeds, keep the soil in good condition, and restore to it its fertility. Thus, in the course of a few years, a new plantation with vigorous plants will stand on the site of the older one.

CONCLUSION.

In concluding I repeat that the two most important steps in the abacá industry, namely, cultivation and extraction of fiber, have not been conducted in a businesslike manner. The great majority of the planters still cling to the two erroneous beliefs that, while the price paid for the fiber remains low, they can neither afford to *cultivate* their fields nor *turn out* superior fiber. They look upon proper cultivation as an unnecessary and unproductive expense, and upon the production of superior fiber as entailing an unnecessary increase of waste. In the latter belief they claim that, as long as they get almost the same price for good as for bad fiber, it is to their advantage to produce the latter. The planters may be right in stating that the local buyers, especially the Chinese, do not properly discriminate between superior and inferior fiber and are therefore encouraging the production of the latter, but this can scarcely justify their conduct. They ought to realize that it is to their interest and the interest of the industry in general to turn out good fiber. They should free themselves from all local buyers who do not treat them justly and should strive to secure the best market for their product.

If a general rise in the price of abacá fiber in any province be desired, a general production of superior fiber must precede it. The planters will not fail to get a suitable market for their product if they work together and discard all methods prejudicial to their interest and detrimental to the industry in general.

STATISTICS REGARDING SUGAR CANE AND TOBACCO IN THE PHILIPPINES.

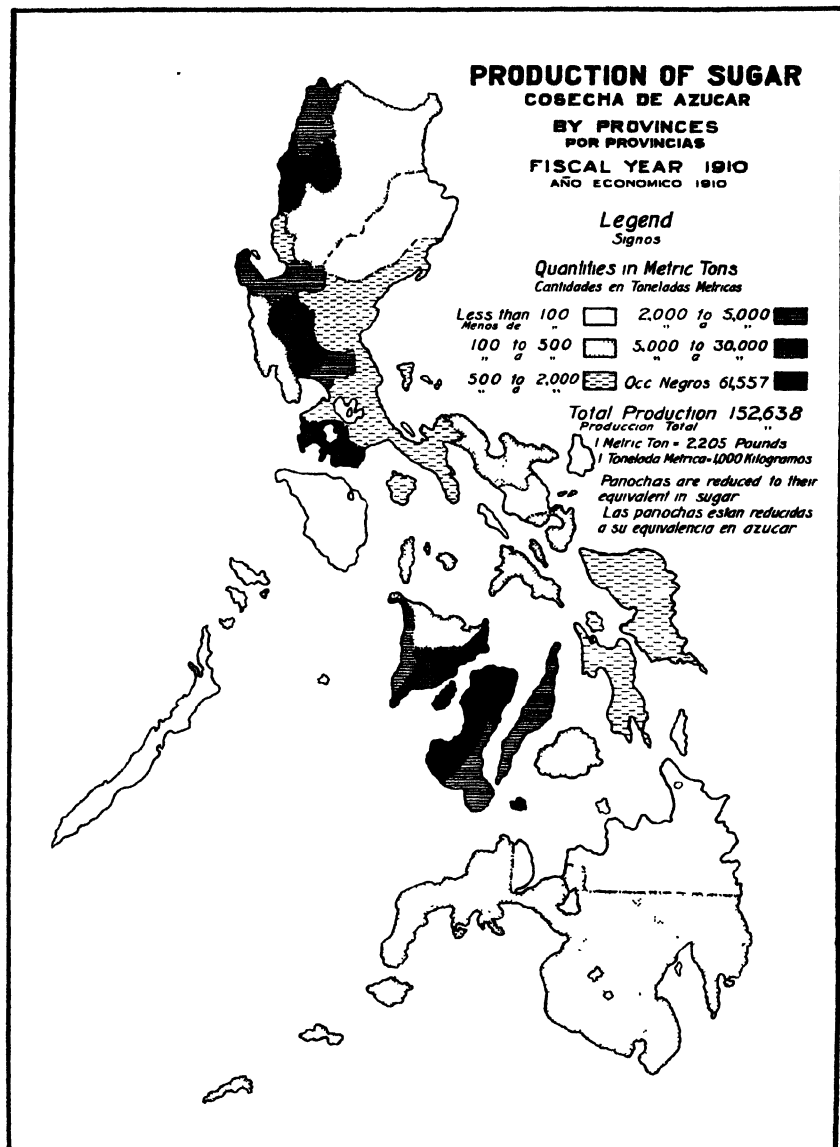
By W. D. HOBART, *Statistician.*

Statistics on sugar in the Philippine Islands, fiscal year 1910.

Province.	Amount of sugar produced.		Area cultivated.	Production per hectare.
	Piculs.	Metric tons.	Hectares.	Kilos.
Agusan				
Albay	1,146	72	141	514
Ambos Camarines	3,081	195	367	531
Antique	53,136	3,364	1,580	2,129
Bataan	7,491	474	341	1,889
Batangas	190,955	12,078	5,183	2,380
Bohol	1,941	123	166	739
Bulacan	54,442	3,443	2,935	1,173
Cagayan	2,154	138	281	484
Capiz	6,729	426	385	1,105
Cavite	24,910	1,576	1,198	1,315
Cebu	33,007	2,088	1,866	1,118
Ilocos Norte	41,443	2,621	2,338	1,121
Ilocos Sur	101,116	6,396	3,412	1,874
Iloilo	124,564	7,879	3,408	2,311
Isabela	475	30	42	716
La Laguna	23,880	1,510	741	2,038
La Union	24,934	1,577	1,018	1,549
Leyte	10,854	687	815	843
Mindoro	177	11	19	589
Misamis	726	46	34	1,350
Moro	1,620	102	119	861
Mountain	2,274	144	175	821
Nueva Ecija	10,055	636	527	1,206
Nueva Vizcaya	617	39	60	650
Occidental Negros	973,231	61,557	26,820	2,235
Oriental Negros	48,266	3,053	1,410	2,165
Palawan	60	4	5	759
Pampanga	454,264	28,732	16,551	1,735
Pangasinan	35,338	2,235	2,794	800
Rizal	30,345	1,919	1,752	1,095
Samar	8,622	545	667	818
Sorsogon	7,292	461	394	1,159
Surigao	425	27	47	572
Tarlac	115,810	7,325	4,427	1,654
Tayabas	15,148	958	1,005	953
Zambales	2,692	170	141	1,207
Total	2,413,270	152,639	88,168	1,835

NOTE.—1 picul=33.25 kilos. 1,000 kilos=1 metric ton.

The differences between the provinces in production per hectare, aside from those arising from varying soil fertility, are in part accounted for by destruction in some localities from drought or storms, or because of locusts or rats. Locusts in some places destroyed a great deal of cane at an early stage of growth, some municipalities reporting an almost total loss.



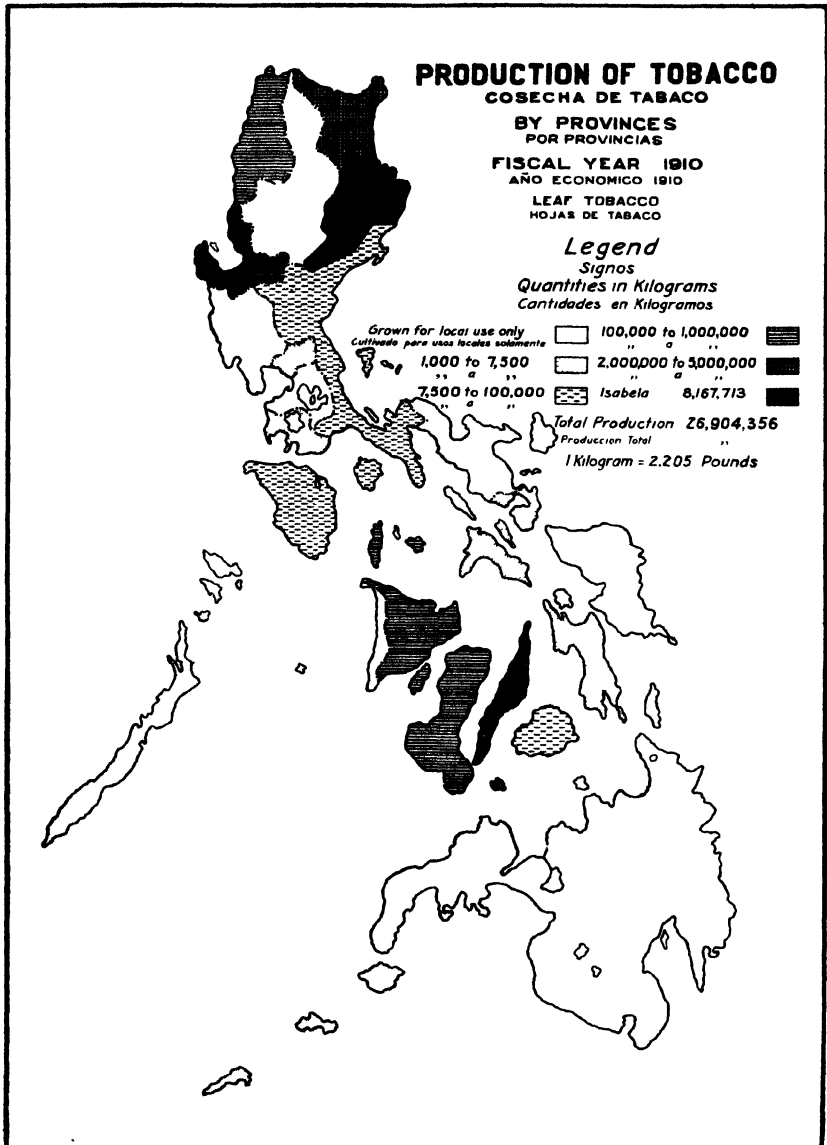
THE PHILIPPINE ISLANDS.

Statistics on tobacco in the Philippine Islands, fiscal year 1910.

Province.	Amount of tobacco produced.		Area cultivated.	Production per hectare.
	Quintals.	Kilos.		
			Hectares.	Kilos.
Agusan				
Albay				
Amboe Camarines				
Antique	605	27,680	57	488
Bataan				
Batangas	701	82,246	97	882
Bohol	462	21,252	98	228
Bulacan	1,078	49,358	68	788
Cagayan	99,786	4,590,156	9,614	477
Capiz	7,048	328,978	895	368
Cavite	60	2,760	20	138
Cebu	102,933	4,784,918	7,248	658
Ilocos Norte	11,080	507,880	1,488	352
Ilocos Sur	5,169	287,774	568	422
Iloilo	18,662	628,452	2,172	289
Isabela	181,158	8,888,268	15,867	525
La Laguna				
La Union	94,957	4,368,022	6,687	658
Leyte	7,548	346,978	1,666	208
Mindoro	957	44,022	180	244
Misamis	88	1,748	18	184
Moro	101	4,646	21	221
Mountain	568	26,128	117	228
Nueva Ecija	4,585	208,610	706	295
Nueva Viscaya				
Occidental Negros	18,281	838,628	1,572	538
Oriental Negros	7,880	362,480	697	520
Palawan	30	1,880	4	845
Pampanga	166	7,636	29	268
Pangasinan	45,805	2,107,080	3,212	656
Rizal				
Samar	1,270	58,420	211	276
Sorsogon	882	15,272	97	157
Surigao	580	24,880	52	468
Tarlac				
Tayabas	2,164	99,644	290	348
Zambales	54	2,484	6	414
Total	608,848	28,006,778	58,626	522

NOTE.—1 quintal (Spanish) = 46 kilos. 1 hectare = 2.47 acres.

The amount of tobacco produced by different soils varies greatly, accounting for the great difference between the various provinces in the production per hectare. In many of the provinces a lighter growth is accounted for because tobacco is planted as a secondary crop to rice or corn.



THE PHILIPPINE ISLANDS.

MANGO PESTS IN CAVITE AND RIZAL.

By P. J. WESTER, *Horticulturist*.

The complaint has frequently been made that the mango trees in the Philippines are not productive, but the growers seem to have accepted this fact as providential, and it is not apparent that anything has been done in the past to ascertain the cause or find a remedy.

The failure of the mango trees to set fruit was recently presented to the Bureau of Agriculture by Miss Francisca Tirona, mango grower in Imus, Cavite Province, and the writer, accompanied by Mr. José Rivera, made a trip of inspection through the mango-growing districts of Cavite Province early in April to investigate the trouble with a view of finding a remedy.

Mangoes are planted extensively at Imus, San Francisco, and San Roque, which towns may be termed the centers of the mango industry in the province. They are also planted in considerable numbers at Caridad, Noveleta, San Juan, and Kawit; a few are also found in Rosario. Traveling to Manila from San Roque on the Cavite line of the Manila Railroad Company the number of trees decreases as one approaches Binacayan, from which point to Manila they occur only as scattered trees. Perhaps it is well to mention here that with exceedingly few exceptions, and those containing only a few trees, orchards or groves of mangoes, as usually understood by these terms, do not exist in the Province of Cavite. Rice is the main agricultural crop in the mango districts of the province, and the mango trees are planted along the edges of the rice fields and along the sides of streams and ravines topographically unsuited for rice cultivation. Except in San Roque and Caridad, where the soil is mostly sandy, the land consists of a stiff loam or clay that during the dry season is baked hard. The trees appear to thrive equally well in either soil and are with very few exceptions vigorous and thrifty, and scale insects are practically absent; the few present do not appear to injure the trees.

Driving through Imus and adjoining barrios, the almost universally blackened and dead flowers on the mango trees at once attracted attention, and frequent stops were made for examination of the flowers. These were in most instances found to be covered with innumerable small wedge-shaped homopterous insects in all stages of development, able to fly or jump but short distances. By sucking the juices from the buds and tender stems, these insects injure them, causing the flowers to drop. They also secrete a honey dew, in which, deposited on the foliage and the flowers, a sooty mold develops, and the presence of the insects is readily detected by the blackened leaves and flower panicles. Where they occur in great numbers their presence is also heralded by a fetid odor recognizable at a considerable distance from the trees. At Imus, these insects have practically ruined this season's mango crop, and are doing great damage to the mangos at San Francisco. Less severe is the injury to the second bloom in San Roque and Caridad, but owing to the ravages of this as well as another pest that will presently be referred to, the early bloom there was practically entirely destroyed. At Muntinglupa, Rizal, in the mango grove owned by McCondray & Co., the insect under discussion was found in comparatively few numbers, and the trees now in bloom give promise of a good crop of fruit.

It is quite probable that this insect is identical with the so-called "mango fly" in India (three species of homoptera (*Idiocerus niveosparvus* Leth., *I. atkinsonii* Leth., and *I. clypealis* Leth.)), which in certain years has been reported to reduce the mango crop to one-third of its normal amount in that country. In India these insects are present on the mango trees throughout the year, but hatch in great numbers every few years in the flowering season and destroy the bloom. It is improbable that the successful spraying of infested trees with London purple, reported in one instance from India, was due to the virtue of the spray, for being a sucking insect it can be combated with a contact spray only. In India the use of contact sprays for this insect has been reported ineffective, but this is, probably due to excessive dilution of the spray, or possibly to the application of the insecticide at a time in the life history of the insect when it is difficult to destroy.

Another pest that appears to be quite destructive to the mango bloom is a caterpillar that enters the central stem of the flower panicle and hollows it out, causing it to shrivel up and die. Specimens of the larvæ were not found, and it is therefore doubtful whether this is the same species as another caterpillar

that gnaws the surface of the stems with the same result and in its progress covers itself with a web of refuse and excrements. Two well-defined species were found engaged in this work, one of which is rare and perhaps of little importance. Particularly destructive work of these caterpillars was seen in San Francisco, but they were also noted at Imus and other points visited. The earliest observations of the stem borer, the first mentioned of these caterpillars, appears to have been made in December, 1910, at Santa Mesa, Rizal, by Mr. O. W. Barrett, superintendent of experiment stations of this Bureau.

An investigation of the life history and habits of these insect pests, whose economic importance in relation to the mango industry in the Philippines does not appear to have hitherto been recognized, will be made by the Bureau of Agriculture, with a view to discovering successful remedies for their control and eradication.

REPORT ON TOBACCO ON THE ISLAND OF CEBU.

By R. W. ROWE, *Tobacco Expert.*

It is estimated that the Island of Cebu produced 3,500,000 kilos of tobacco during the year 1910. Of this amount, 3 per cent was consumed in the Visayan Islands; the remainder was sold for export to foreign countries.

On the east coast the principal tobacco-producing municipalities are Tabogon, Carcar, Sibonga, and Argao, and on the west coast Tuburan, Asturias, Balamban, Toledo, Barili, Dumanhug, and Moalbual. Nearly all the other towns along the coast produce a little tobacco, which is consumed locally.

On account of climatic and soil conditions, a heavy, dark leaf is produced, suitable only for export to countries that demand a heavy textured and dark colored leaf.

The island varies in width from 8 kilometers at the southern end to 29 kilometers at Danao, then decreasing to 12 kilometers at the northern end. There is a ridge of mountains extending along the entire east coast, 4 to 7 kilometers back from the coast and crossed by a number of rivers along which are narrow winding valleys. On the west coast the same conditions exist except the mountains are farther back and between the ridges the country is very hilly. Practically all of the tobacco is produced on the slopes of hills and mountains that are exposed to the salt air, which has long been known to be injurious to fine grades of tobacco. The soil is derived from coralline limestone and varies in color and texture from a brown silt loam to a heavy black clay, on which only a dark heavy leaf can be produced. The general character of the leaf produced is as follows:

Color: Small leaves very dark, large leaves dark and uneven in color.

Shape: Varying from a short narrow leaf to a long, wide, pointed leaf, there being no uniformity in shape.

Veins: The midrib is large. Lateral veins and feeders large, irregular and wiry.

Texture: All leaves heavy.

Stretch: Good, as it always is on heavy textured types.

Finish: Good, when picked at proper stage of ripeness and properly cured.

Grain: Close and poor.

Burn: Poor.

Ash: Dark and very compact.

It is acknowledged by the best tobacco men in the Philippine Islands that Cebu tobacco is not suitable for cigars, but only for export.

The Filipinos are accustomed to this strong tobacco and prefer it to any other, and it can be found in almost every public market in the Visayan Islands. There are no large tobacco haciendas on the Island of Cebu. The tobacco is grown in small patches of 500 to 5,000 plants and on all kinds of soil. As a rule it is grown in the same field with corn and in many instances one can see both crops growing together, first a row of corn then a row of tobacco. Another custom is to leave the cornstalks standing after picking the corn, to act as a shade for the tobacco plants, later cutting down and removing them when the tobacco has started to grow.

The local planters have no special time to sow their seed beds, but sow them any time from the first of September to the first of January. They select no special place for the seed beds; most any place that is handy to the field where the tobacco is to be grown is considered satisfactory. The bed receives no care after the seeds are sown; if they do not come up more seed is sown. The farmers also have no special time for transplanting, but transplant any time from the last of October to the last of February. Ten thousand to 12,000 plants are set to one hectare, yielding on an average 10 quintals. The best tobacco is secured from plants transplanted the last of October and the first part of November. Tobacco that is transplanted later does not produce as many leaves, or as good a leaf; also, insects do not bother the early set tobacco as much as the late set.

Practically all the cultivation is done by hand with a bolo, and as a rule the fields are kept clear of weeds. Not only are the fields cultivated by hand but the land is prepared in the same manner, this being due to the scarcity of carabaos and the steep slopes on which the tobacco is raised, which can not be cultivated with a carabao and a plow. Plants of all sizes may be seen in one field, there being no uniformity. Several different types may be seen also, which shows that no attention is paid to seed selection. The leaves are harvested at all stages of ripeness, and as a rule they are picked a little green, which, when cured,

gives a very dark, strong leaf. After the leaves are picked they are strung, without folding, on a piece of bejuco (rattan) varying in length from 1 to $1\frac{1}{2}$ meters. After stringing they are hung under the houses by tying the ends of the bejuco around a pole. As soon as air cured, the tobacco is taken down, put in "manos" (hands) of 100 leaves which are tied up with grass, and then put in piles to ferment. The grading is the same as in all other sections—by length and soundness. The best grades, called "escogidos," are sold locally and a mano three years old brings ₱3 to ₱4, and when sold by the leaf 5 centavos a leaf. The price varies from 1 to 5 centavos a leaf, depending on the age of the tobacco. All of the poorer grades are sold by the quintal for export, the price varying according to the demand. The *Compañía General de Tabacos de Filipinas* are the principal buyers and have warehouses in all the important tobacco sections. There are also a few Chinese buyers.

The principal work to be done with tobacco in this section is to increase the yield per hectare, which can be done by taking better care of seed beds; transplanting the last of October or early in November, depending somewhat upon the weather; applying a mixture of Paris green and slaked lime with a hand bellows to kill the insects, which destroy considerable tobacco every year; harvesting at the proper stage of ripeness; and introducing better methods of curing. The one and most important point, that at present receives no attention, is seed selection. The early set plants having the largest and greatest number of leaves on the stalk should be utilized for seed and all other plants topped. If this were done every year in a short time there would be a uniform shaped leaf and uniform stand of plants in the fields, which would not only increase the yield, but also the percentage of the best grades of tobacco.

MONTHLY VETERINARY REPORTS—APRIL AND MAY.

During the past month there has been a marked improvement in the rinderpest situation in the Southern Islands.

The infected provinces of Luzon in which it has been possible to place a sufficient force of veterinarians and assistants have shown improvement, but several new centers of infection have been discovered.

Cagayan.—Two municipalities, Aparri and Solana, are infected.

Isabela.—There are no known infected localities in this province, although disease may be expected to reappear as a result of the recent infection.

La Union.—This province has at present two infected municipalities, but the disease has been well under control and only a few cases have occurred.

Mountain Province.—One case of rinderpest has been discovered in the Mountain Province just across the boundary line from the Province of La Union. This case undoubtedly resulted from the infection in the adjoining Province of La Union. Immediate steps were taken to eradicate this infection in the Mountain Province and it is believed that no more cases will occur.

Pangasinan.—The large force that was carrying on the rinderpest campaign in Pangasinan at the time of the last monthly veterinary report is still maintained in this province and the work is now beginning to show results. There are still practically the same number of infected municipalities, but the principal centers of infection have been discovered and quarantined. This should result in the reduction in the number of infected barrios during the next month.

The rinderpest outbreak in Pangasinan Province has been one of the most sweeping outbreaks that has occurred for some time. Beginning in the western part of the province it gradually extended eastward and threatened at one time to extend over the entire Island of Luzon. This it possibly would have done had it not been for the timely and valuable assistance rendered by the Philippine Scouts in maintaining quarantine.

Tarlac.—No important changes have taken place in this province during the past month, although the infected area is slightly larger than at the time of the preceding report.

Pampanga.—There has been a marked improvement by the reduction of a number of cases in infected barrios. Although several municipalities are still considered infected, there have been very few cases of rinderpest in this province during the past two weeks.

Bulacán.—The situation in this province is practically the same as a month ago.

Zambales.—Rinderpest was first reported in the municipality of San Narciso. Upon investigating this report several cases of the disease were discovered. An inspection of the neighboring municipalities was made and it was found that San Antonio, San Felipe, and San Marcelino were also infected. As this province has been free from disease for a considerable length of time, it is probable that the infection was carried from the Province of Pangasinan by some coastwise sailing craft.

Bataan.—Rinderpest has existed in the municipality of Dinapighan during the entire month.

Cavite.—Rinderpest has appeared during the month in three municipalities.

La Laguna.—Rinderpest has recently appeared in the municipalities of Mabitar, Sinaloa, and Santa Maria.

Rizal.—During the month rinderpest has been discovered in three more municipalities, but only one of these municipalities has suffered any considerable loss.

Cebu, Leyte, and Surigao.—There has been no material change in the rinderpest situation in these provinces during the month.

Misamis.—Rinderpest has again appeared on the Island of Mambajao.

Bohol.—No cases of rinderpest have been discovered since March 30 and this island is considered to be free from the disease.

Iloilo.—Only one municipality of this province is considered infected, and in this municipality there have been no cases for several days.

Oriental Negros.—There has recently been a remarkable improvement in the situation in this province. Only four municipalities are now known to be infected, and in two of these there have been no cases for several days. Since the latter part of March there have been about 300 Scout troops on duty as quarantine guards in the Provinces of Oriental Negros and Cebu, the majority of which have been in Oriental Negros. The arrival of the Scouts was followed by a noticeable improvement in the situation in Oriental Negros, and undoubtedly its present condition is largely due to the work of these troops.

MONTHLY CROP REPORTS—APRIL AND MAY.

ABACÁ.

Batangas.—The price of abacá, of which Lipa, Cuenca, and Tanauan raise some quantity, has gone up 50 per cent. The province as a whole is in a more prosperous condition than at any time since American occupation.

Mindoro.—Abacá is doing well in this province.

Misamis.—In the past abacá was the chief and most profitable crop in this province. On account of the low prices paid for abacá during the last two years many people have discontinued its cultivation and have taken up the cultivation of coconuts instead.

Moro Province (Davao).—The output of abacá is continually increasing, and agricultural conditions are very satisfactory. One concern in this district shipped over 1,000 piculs during March, which was one month's harvest and purchase. The three plantations at Lais, Malita, and Lacaron shipped a total of 600 piculs in March. The steamship *Brutus* on April 6 was loading approximately 4,000 piculs. As abacá is the staple article of commerce in Davao, it can be seen that conditions in this district are satisfactory. Twenty abacá cleaning machines are expected in the near future, and if these machines are a success it is expected that the output of hemp will be materially increased and that commercial conditions will be greatly improved.

Occidental Negros (northern section).—About 10,000 piculs of abacá will be harvested in the northern part of this province during the present year. The lack of stripping machines results in considerable abacá that is grown not being harvested. This province produces a good grade of fiber for which there is an excellent demand in Iloilo.

Occidental Negros (southern section).—About 1,200 piculs of abacá will be harvested during the year. Difficulty is experienced in handling this crop because of lack of labor.

Samar.—The price of abacá is fair and quite an amount is being stripped and sold.

COCONUTS.

Mindoro.—Coconuts are doing well in this province.

Misamis.—There are many extensive coconut plantations in this province, from which a considerable revenue is derived. The present price of copra is ₱8.50 per picul. This business is so profitable that new plantations are being started.

Occidental Negros (northern section).—There has been practically no increase or decrease in this crop as compared with last year. The crop from June, 1910, to March, 1911, is estimated at about 3,500 piculs.

Occidental Negros (southern section).—It is estimated that 5,000 piculs of copra will be harvested. The high price of this product is encouraging many people to plant coconuts in this section.

CORN.

Bohol.—There was sufficient rainfall during the month of April and young corn, where it has been planted, is in a thriving condition. Considerable damage has been done to the corn crop in certain parts of this island by monkeys.

Cagayan.—Corn is the staple food of the larger part of the people in this valley, and the present crop is totally insufficient to supply the needs of the people. The corn is suffering severely from drought.

Cebu.—During the months of April and May the principal crop of corn in this province is planted, and a great deal was being planted during the latter part of April. The price of corn in the vicinity of Cacar is ₱4.50 per cavan.

Ilocos Sur.—The corn crop in Abra is less than last year, due to the severe wind storms occurring from October to November.

Isabela.—In Cabagan Nueva and Tumauni the corn crop has received a severe setback due to the excessive dry weather, and many fields of corn wilted down before blossoming. In Cauayan, Tagle, and Echague corn is in fine condition.

Mountain Province (Apayao).—Some of the farmers are just planting corn while others have it in the roasting-ear stage. The corn which is in the ear is very poor, having small ears and being only about 1 meter high.

Occidental Negros (northern section).—The corn crop has been small on account of the November typhoon. It is estimated that 250,000 cavans will be harvested.

Occidental Negros (southern section).—This crop is of little importance, the entire amount of corn harvested in the southern

part of the province being about 50,000 cavans. Corn is a staple food product in the northern part of the province but not in the southern.

• RICE.

Ambos Camarines.—The rice crop is beginning to ripen in Camarines Norte and bids fair to be the largest that has been harvested in that section for many years. Not only has the area planted been greater than during any year since American occupation, but the crop is said to be much better than usual and has not been molested by the many enemies of rice. Harvesting is nearly over in the central part of the province and the crop seems to have been light, although the area planted was larger than that planted last year.

Bohol.—Most of the people in the interior are busy gathering their rice crop. Considerable difference of opinion exists in regard to the present rice crop. The crop has been practically all harvested and the yield is estimated to have been better than last year, especially in the towns of Bilar and Batuan. These two towns could easily furnish all of the rice for the entire coast, but the owners of the land do not cultivate all of their land, both on account of the scarcity of work animals and because of the difficulty in the transportation of their products to the coast towns.

Isabela.—In Santiago the early plantings of rice have been cut and yielded a good crop. All of the later plantings, however, have been killed out by lack of water. Considerable rice is now coming in to Echague from Nueva Vizcaya. This product is selling for ₱11 per carga (32 gantas) in the local market.

La Laguna.—The second rice crop is flourishing.

Mindoro.—Preparation is being made to plant a big crop of rice.

Mountain Province (Apayao).—Land from which tobacco has been removed is now being prepared for rice. Rice is also being planted on the same land with corn. All of the rancherias on the Apayao river have cleaned considerable land on the hillsides for this year's rice crop.

Occidental Negros (northern section).—The rice crop is small in this section and will hardly amount to 75,000 cavans, owing to the late rains of last year and to the typhoon which devastated this part of the province in November.

Occidental Negros (southern section).—This crop has suffered from long droughts, and it is estimated that the crop will be only about 150,000 cavans. There is a large demand for rice at the

present time and scarcity of labor to harvest the crop, so that prices are high.

Samar.—The price of rice on the east coast has risen to ₱7.50 per sack, owing to the fact that unfavorable winds have kept the smaller craft of the Chinese merchants from plying along the coast, and therefore from supplying municipalities and barrios of that section with rice. The rice fields are in excellent condition and an extraordinarily good crop is expected.

SUGAR CANE.

Batangas.—Sugar cane, which is the principal crop of practically all the municipalities of the province with the exception of Tanauan and Santo Tomas (where oranges come first and sugar second), has given a very good yield with the unprecedented price ₱7.80 per picul reached.

Bohol.—The condition of the sugar-cane crop early in April was not satisfactory because of an excess of rain. The yield of sugar cane has not been as good as was expected.

Cebu.—A comparatively good crop of sugar cane is being cut during this season.

Ilocos Sur.—Sugar cane is still being harvested in certain sections of the province. The price is low, being about ₱2.50 a picul. One sugar planter in this province has hired men from Negros to show the people how to make clean, white, fine sugar. At least 50,000 piculs of sugar have been shipped from Candon and 20,000 from Solbeck, Narvacan.

Iloilo.—In the central part of the province where sugar is the main crop the work for the last month has been almost altogether devoted to the planting and cultivating of sugar cane. A small amount of cane has been planted in the southern part of the province. Many new sugar plantations are being opened up.

La Laguna.—The cane growers fear that it will be impossible to mill their entire crop on account of inadequate milling facilities and the recent rains. All of the planters report an abundant yield and superior quality of sugar.

La Union.—The sugar crop is larger this year than it has been during previous years, it being estimated that 7,800 piculs of sugar will be harvested. With present sugar prices no other crop pays as well, and each year will, no doubt, see an increase in this industry.

Nueva Ecija.—The sugar crop in this province for the past season has been good.

Occidental Negros (northern section).—There would be no risk in stating that in this province the present year will show an increase of 10 per cent in the sugar crop. As the sugar crop for this section of the province last year was about 519,700 piculs, the crop for the present year will not be less than 571,670 piculs. The scarcity of labor is felt everywhere owing to the increased planting of cane.

Occidental Negros (southern section).—It is estimated that the sugar crop for this part of the province will be about 747,500 piculs. Encouraged by the hope of better prices many of the sugar planters have attempted to carry on operations more extensive than was practicable with the means at hand. As a result there is a possibility that some of the sugar cane fields will not be harvested.

TOBACCO.

Cagayan.—The agricultural outlook is very poor. This year's tobacco crop promises to be one of the poorest in many years.

Ilocos Sur.—Tobacco in Abra is at least 3 per cent more than last year. A great deal more has been planted and the yield is above the average.

Iloilo.—Tobacco looks exceptionally well and there seems to be more planted this year than is usual. In the central part of the province where about all of the tobacco is raised it is noticeable that practically all of this crop is in very good condition.

Isabela.—In Cabagan Nueva and Tumauini tobacco has suffered severely from dry weather, all of the tobacco being small and badly worm eaten.

In Ilagan and Gamu there will probably be a fair tobacco crop.

In Cauayan, Tagle, and Echague there is a fine stand of tobacco, which is exceptionally free from worms and disease, although in Echague a number of fields of tobacco have been entirely destroyed by what is claimed to be a new disease in this locality. The disease begins on the roots and follows up the stalk. Upon examination it is found that the root just below the surface of the soil is infected with a blight and has a moldy or musty odor. There is a rusty yellowish stain about one-fifth of a centimeter in diameter that begins at the root and follows up the stalk. This stain follows up the midrib of each leaf and as it ascends the leaf droops and dies. The upper leaves on affected plants that have not been reached by this stain appear to be normal. The tobacco crop for 1910, with the exception of

that produced in the municipalities of Gamu and Echague, has been sold and shipped either to Manila or Lallo, Cagayan. The average price paid for the crop for 1910 was ₱3.50 to ₱4 per fardo.

La Union.—The tobacco crop north of San Fernando will probably fall short, owing to the drought, but in the southern part of the province there will be a good crop.

Mountain Province (Apayao).—In some of the rancherias the people are gathering tobacco, in others it appears to have been planted only a short time. The tobacco crop appears to be in poor condition, the leaves being very small and badly worm eaten.

Nueva Ecija.—The tobacco crop has been good.

Occidental Negros (northern section).—This crop has been far from satisfactory. The November typhoon destroyed a great deal of tobacco so that the entire crop will be about 700 piculs instead of 886, which was the production last year.

Occidental Negros (southern section).—This crop is unimportant in this part of the province, and not more than 100 quintals will be harvested.

MARKET REPORTS.

By KERR & Co.

NOTES ON MANILA MARKETS FOR APRIL.

(Based on advices from New York, March 24; San Francisco, March 29; London, March 30; Hongkong, April 25; Iloilo, April 29; Cebu, April 29.)

SUGAR.

Iloilo.—Few transactions have taken place in the interval; we quote No. 1 ₱7.50, No. 2 ₱7, and No. 3 ₱6.25 per picul.

Manila.—Business done basis ₱6.50 per picul No. 1, ₱6 No. 2, and ₱5.50 No. 3.

Cebu.—Sellers at ₱7.25 per picul No. 1, ₱6.75 No. 2, and ₱5.75 No. 3.

HEMP.

Market has continued dull; we quote fair current for America ₱7.75 and for United Kingdom ₱7.50 per picul f. o. b. Values of better grades have dropped smartly to basis ₱15 per picul good current f. o. b. Receipts at all ports for the four months are 457,031 bales against 419,265 bales 1910 and 409,593 bales 1909.

COPRA.

Firmer with buyers at ₱9.75 per picul Manila fair merchantable and ₱10.25 Cebu fair merchantable sun dried f. o. b.

DISTRIBUTION OF PRINCIPAL PHILIPPINE EXPORTS FOR THE FOUR MONTHS JANUARY TO APRIL, 1911.

Products exported.	United States.	China.	Pacific coast.	Great Britain.	Continent of Europe.	Australia.	Japan.	Singapore.
Dry sugar (tons) -----	30,025	9,479	3,800					
Hemp (bales) -----	159,588	3,400	21,851	171,872	33,287	8,208	10,182	3,835
Copra (piculs) -----	8,400		60,000	18,400	351,888		500	
Cigars (thousands) -----	1,979	10,861	4,475	4,380	3,006	3,148	272	4,887

MANILA FIBER MARKET.

Manila hemp receipts and shipments.

(Telegram from Manila to London, May 8, 1911.)

	1911	1910
	<i>Bales.</i>	<i>Bales.</i>
Hemp receipts at Manila since January 1	377,159	341,644
Hemp receipts at Cebu, etc., since January 1	108,186	111,529
Hemp receipts at all ports since January 1	485,345	453,173
Shipments to United Kingdom by steamer, cleared since January 1	198,372	142,323
Shipments to Atlantic coast, United States, by steamer, cleared since January 1	138,180	172,662
Shipments to Pacific coast, United States, by steamer, cleared since January 1	54,984	42,898
Shipments to Continental ports, by steamer, cleared since January 1	11,772	18,734
Shipments to all other ports	26,575	
Local consumption since January 1	4,000	
	30,575	26,603
Loading steamer on the berth for the United Kingdom, about	15,000	42,500
Loading steamer on the berth for Atlantic coast, United States, about	18,000	16,000
Loading steamer on the berth for the Pacific coast, United States, about		1,000

Bales of hemp loading for United Kingdom, by steamer Moorlands 15,000

Bales of hemp loading for United States

By steamer Sandon Hall 8,000

By steamer Strathguy 6,000

By steamer Matoppo 4,000

ILOILO SUGAR MARKET FOR APRIL.

By FIGUERAS HERMANOS.

Exports up to April 30, 1911.

(In piculs.)

To—	1909-10 crop		1910-11 crop	
	Superior	Wet	Superior.	Wet.
United States	421,800		386,000	
China	64,575	186	135,972	29.38
Total	489,375	186	521,972	29.38

CROPS PLANTED AND HARVESTED AND CONDITION OF SAME TAKEN FROM QUARTERLY CROP REPORTS FOR THE QUARTER ENDING DECEMBER 31, 1910.

By WM. D. HOBART, *Statistician.*

[NOTE.—Attention is invited to the fact that rice should be understood as being in the unbulled state. 75 liters=1 cavan; 63.25 kilos=1 picul; 46 kilos=1 quintal; 11.5 kilos=1 arroba; 0.4047 hectare=1 acre.]

Province and crop.	Condition.	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
Agusan:		<i>Hectares.</i>	<i>Hectares.</i>		
Rice	Good	497	200	315,750	Liters.
Abaca	do	710	1,083	273,788	Kilos.
Copra	do			15,000	Do.
Corn	Fair	47	30	60,000	Liters.
Albay:					
Rice	Good	8,461	11,774	10,048,900	Do.
Abaca	do	295	23,168	4,661,770	Kilos.
Copra	do			494,767	Do.
Sugar cane	do	51	105	66,484	Do.
Corn	Fair	127	96	56,385	Liters.
Ambos Camarines:					
Rice	do	21,376	8,046	8,702,746	Do.
Abaca	Good	337	9,535	1,871,228	Kilos.
Copra	do			261,056	Do.
Sugar cane	Fair	184	209	120,355	Do.
Corn	do	191	96	68,038	Liters.
Antique:					
Rice	do	107	21,493	22,390,614	Do.
Abaca	do	22	32	10,159	Kilos.
Sugar cane	do	288	46	62,698	Do.
Copra	do			24,975	Do.
Corn	do	26	1	300	Liters.
Bataan:					
Rice	do	5	2,368	5,144,847	Do.
Sugar cane	Good		2	5,692	Kilos.
Corn	Fair	9	184	150,075	Liters.
Batangas:					
Rice	do	709	14,842	11,159,790	Do.
Abaca	do		252	34,028	Kilos.
Copra	do			13,409	Do.
Sugar cane	do	210	15	10,115	Do.
Corn	do	1,507	174	52,250	Liters.
Bohol:					
Rice	do	15,697	18,930	16,327,668	Do.
Abaca	do	20	772	213,618	Kilos.
Copra	Good			885,229	Do.
Sugar cane	do	120	96	70,070	Do.
Corn	Fair	1,679	1,412	532,585	Liters.
Bulacan:					
Rice	do	4,105	15,709	30,485,625	Do.
Sugar cane	Good	219	9	5,100	Kilos.
Corn	Fair	1,207			
Tobacco	do	685			
Cagayan:					
Rice	do	3,429	5,597	6,538,200	Liters.
Sugar cane	do	80	105	59,125	Kilos.
Corn	do	1,102	1,252	1,465,856	Liters.
Tobacco	do	2,654	801	1,924,546	Kilos.
Capiz:					
Rice	do	13,831	53,724	48,572,437	Liters.
Abaca	do	151	972	200,126	Kilos.
Copra	do			292,985	Do.
Sugar cane	do	33	224	94,709	Do.
Corn	do	90	191	49,417	Liters.
Tobacco	do	297			

Crops planted and harvested, etc.—Continued.

Province and crop.	Condition.	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
Cavite:		<i>Hectares.</i>	<i>Hectares.</i>		
Rice	Fair	2,686	6,421	10,016,099	Liters.
Abaca	Good		370	71,585	Kilos.
Copra	do			10,436	Do.
Sugar cane	Fair		95	109,953	Do.
Corn	do	1,038	80	79,178	Liters.
Cebu:					
Rice	Fair	694	2,334	2,167,830	Liters.
Abaca	Good	4,700	940	181,191	Kilos.
Copra	do			718,375	Do.
Sugar cane	Fair	2,520	599	475,839	Do.
Corn	do	26,389	25,361	16,569,240	Liters.
Tobacco	do	3,950	3	132	Kilos.
Magney	do	153	761	239,250	Do.
Ilocos Norte:					
Rice	do	15	40,053	68,891,116	Liters.
Sugar cane	do	481	706	886,240	Kilos.
Corn	do	212	114	157,650	Liters.
Tobacco	do	452			
Ilocos Sur.					
Rice	do		39,720	59,045,930	Do.
Sugar cane	Good	131	465	550,374	Kilos.
Corn	do	1,276	25	37,500	Liters.
Tobacco	Fair	415			
Magney	Good	8	195	214,099	Kilos.
Iloilo:					
Rice	Fair	14,252	39,086	23,373,245	Liters.
Abaca	Good	108	426	80,960	Kilos.
Copra	do			32,756	Do.
Sugar cane	do	255	415	475,794	Do.
Corn	Fair	42	67	105,494	Liters.
Isabela:					
Rice	do	310	1,486	1,454,900	Do.
Abaca	do	494	1,471	934,500	Do.
Tobacco	do	6,528	6,699	2,601,167	Kilos.
La Laguna:					
Rice	do	2,000	2,957	4,645,600	Liters.
Abaca	do	2	268	151,780	Kilos.
Copra	do			2,555,235	Do.
Corn	do	146	239	141,165	Liters.
La Union:					
Rice	do		30,041	44,698,225	Do.
Copra	Good			3,444	Kilos.
Sugar cane	Fair	114	133	167,060	Do.
Corn	Good	509	264	122,907	Liters.
Tobacco	Fair	2,303			
Leyte:					
Rice	do	3,006	12,968	8,497,141	Do.
Abaca	Poor	1,169	22,505	5,360,475	Kilos.
Copra	do			995,686	Do.
Sugar cane	Fair	133	672	1,013,119	Do.
Corn	Poor	1,851	2,222	963,875	Liters.
Tobacco	Fair	104	326	105,742	Kilos.
Mindoro:					
Rice	do	14	4,909	7,364,569	Liters.
Abaca	Good	37	334	123,187	Kilos.
Corn	Fair	31	43	35,325	Liters.
Tobacco	do	163			
Misamis:					
Rice	do	740	3,847	6,101,775	Do.
Abaca	do	7	7,549	1,636,889	Kilos.
Copra	Good			493,245	Do.
Corn	Fair	275	1,909	1,648,700	Liters.
Moro:					
Rice	do	3,758	2,770	4,267,360	Do.
Abaca	Good	181	6,358	1,793,292	Kilos.
Copra	do			1,045,413	Do.
Corn	do	34	116	157,675	Liters.
Mountain:					
Rice	do	427	9,466	14,391,726	Do.
Tobacco	Fair	32	7	3,762	Kilos.
Coffee	do	41	116	12,521	Do.
Nueva Ecija:					
Rice	Good	675	38,862	84,003,365	Liters.
Sugar cane	do	292	253	425,064	Kilos.
Corn	Fair	357	32	23,250	Liters.
Tobacco	do	1,194			

Crops planted and harvested, etc.—Continued.

Province and crop.	Condition.	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
Nueva Vizcaya:		Hectares.	Hectares.		
Rice	Good	315	126	114,975	Liters.
Sugar cane	do	15	2	1,881	Kilos.
Tobacco	do	182			
Occidental Negros:					
Rice	Fair	204	18,561	25,719,825	Liters.
Abaca	Good	87	648	192,610	Kilos.
Copra	do			377,481	Do.
Sugar cane	do	7,804	4,498	10,581,925	Do.
Corn	do	489	939	865,500	Liters.
Tobacco	Fair	324			
Oriental Negros:					
Rice	do	379	772	774,150	Do.
Abaca	do	1,795	334	214,023	Kilos.
Copra	Good			693,831	Do.
Sugar cane	Fair	312	250	802,073	Do.
Corn	Poor	4,832	6,768	4,385,561	Liters.
Cacao	Fair	185	43	2,762	Kilos.
Palawan:					
Rice	do		1,826	1,931,475	Liters.
Copra	Good			30,778	Kilos.
Sugar cane	do		6	4,111	Do.
Pampanga:					
Rice	Fair	4,272	23,147	26,671,325	Liters.
Sugar cane	do	3,661	6,175	9,608,947	Kilos.
Corn	do	76	181	55,250	Liters.
Tobacco	do	111			
Pangasinan:					
Rice	do	10,965	131,415	203,716,280	Do.
Copra	Good			282,426	Kilos.
Sugar cane	do	377	1,037	1,364,774	Do.
Corn	Fair	716	1,336	1,078,870	Liters.
Tobacco	do	5,004	9	3,590	Kilos.
Rizal:					
Rice	Good	40	11,585	19,111,975	Liters.
Sugar cane	Fair	29	208	156,860	Kilos.
Corn	Good	148	243	195,580	Liters.
Samar:					
Rice	Fair	5,480	3,160	2,873,278	Do.
Abaca	do	1,012	7,543	2,018,547	Kilos.
Copra	Good			843,704	Do.
Sugar cane	Fair	170	415	256,563	Do.
Corn	Good	1,161	148	174,606	Liters.
Tobacco	do	149	313	13,773	Kilos.
Sorsogon:					
Rice	Fair	7,839	1,928	1,664,565	Liters.
Abaca	Good	323	23,950	5,547,146	Kilos.
Copra	Fair			295,748	Do.
Sugar cane	do	47	195	244,248	Do.
Corn	do	382	243	113,610	Liters.
Surigao:					
Rice	Good	6,773			
Abaca	Fair	200	1,473	532,619	Kilos.
Copra	Good			102,607	Do.
Sugar cane	Fair	25	8	13,500	Do.
Corn	do	54	1,075	1,556,030	Liters.
Tobacco	do		63	31,404	Kilos.
Tarlac:					
Rice	do	25,777	37,623	40,674,075	Liters.
Sugar cane	do	934	920	1,170,800	Kilos.
Corn	Good	26	7	14,400	Liters.
Tobacco	do	114			
Tayabas:					
Rice	do	5,470	14,514	12,164,129	Do.
Abaca	do	17	423	106,156	Kilos.
Copra	do			3,697,073	Do.
Sugar cane	do	57	985	1,037,542	Do.
Corn	Fair	45	131	55,045	Liters.
Zambales:					
Rice	do	777	10,925	13,908,421	Do.
Copra	do			17,710	Kilos.
Sugar cane	do	42	78	124,512	Do.
Corn	Good	81	12	8,860	Liters.

NOTE.—Statistics are kept of the number of coconut trees, so the number of hectares harvested can not be shown.

RANGE OF PRICES OF PHILIPPINE AGRICULTURAL PRODUCTS.

Highest and lowest prices of unhulled rice, abaca, copra, sugar, tobacco, and corn for the quarter ending December 31, 1910.

[Note.—75 liters=1 caran; 63.25 kilos=1 picul; 46 kilos=1 quintal; 11.5 kilos=1 arroba.]

Province.	Unhulled rice per 75 liters.		Abaca per 63.25 kilos.		Copra per 63.25 kilos.		Sugar per 63.25 kilos.		Tobacco per 46 kilos.		Corn per 75 liters.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
Agusan	3.75	1.50	10.12	8.09	9.49	8.85					5.25	2.00
Albay	3.75	1.87	8.86	5.06	13.50	8.06					8.00	1.50
Ambo (Samarines)	4.50	1.50	8.22	4.50	9.49	5.06					2.25	1.50
Antique	3.00	2.25	18.98	12.00	10.75	7.35	9.49	7.59			2.50	2.25
Bataan	3.50	2.00					8.22	8.22				
Batanes	4.50											
Batangas	3.75	2.25	17.00	8.00	13.92	6.33	9.49	5.00	18.40	6.75	3.75	2.25
Bohol	4.00	2.25	14.65	8.25	10.12	8.22	6.33	7.59	23.00	7.36	4.50	2.25
Bulacan	3.00	2.00					8.50				3.00	3.00
Cagayan	5.00	3.37							19.78	8.28	3.75	2.50
Capiz	3.75	2.00	13.72	6.33	10.00	5.69	7.00	6.33	18.40	4.60	3.75	1.50
Cavite	3.97	1.87	18.00	14.55			8.60	4.43	23.00	5.06	4.50	2.25
Cebu	5.25	1.50	15.18	9.49	11.39	5.06	4.00	4.00	30.00	4.00	3.00	1.50
Ilocos Norte	4.50	2.50					8.22	5.00	25.00	9.20	3.20	2.00
Ilocos Sur	5.00	2.25	16.81	12.65	12.65	6.33			27.60	7.20	3.25	3.50
Iloilo	4.05	2.00									3.00	1.50
Isabela	5.00	3.75	15.81	6.31	9.50	6.96					4.00	1.50
La Laguna	3.75	2.25			12.65	8.22	7.50	4.43	20.70	4.00	3.25	1.40
Leyte	3.25	2.00	14.00	5.06							2.50	2.25
Mindoro	3.00	2.50	13.30	9.49	9.50	5.69					3.00	2.25
Misamis	3.75	1.50	12.00	4.11	9.50						3.00	1.50
Monte	6.00	2.00	13.00	6.32	9.49	6.96					3.00	1.50
Moroto	4.20	1.25					16.00	3.00	18.40	2.00	4.50	1.00
Nueva Ecija	3.75	3.12					11.00	3.00	36.80	11.00	3.75	1.75
Nueva Vizcaya	3.05	1.87	17.08	6.32	12.02	8.00	8.56	5.00			3.75	2.00
Occidental Negros	5.00	2.25	15.18	5.70	10.75	6.96	6.33	5.06			5.00	2.25
Palawan	3.00	3.00			9.50	5.06						
Pampanga	3.25	2.20					8.22	4.43	25.30	6.90	3.75	1.50
Pangasinan	4.50	1.50			12.65	5.06	10.12	4.43			4.50	1.50
Rizal	3.37	1.50					9.49	8.22			4.50	1.50
Samar	5.25	2.25	16.00	5.59	9.49	6.33			13.80	5.98	4.00	1.50
Sorsogon	5.00	1.87	13.92	5.06	9.49	5.69			27.60	2.50	2.50	2.00
Surigao	4.50	2.50	12.65	5.69	10.75	8.22					2.00	1.87
Tarlac	4.00	1.50					8.22	4.50			5.00	1.50
Tayabas	5.25	1.50	11.39	5.69	9.00	3.69					4.50	3.75
Zambales	5.00	1.25					7.59	7.59				

TEMPERATURE AND RAINFALL FOR AGRICULTURAL DISTRICTS IN THE PHILIPPINES.

By the DIRECTOR OF THE WEATHER BUREAU.

APRIL, 1911.

[Temperature and total rainfall for twenty-four hours beginning at 6 a. m. each day.]

Date.	Hemp.				Sugar, Iloilo.		Rice, Tarlac.		Tobacco.			
	Albay.		Tacloban.		Temperature.	Rainfall.	Temperature.	Rainfall.	Aparri.		San Fernando.	
	Temperature.	Rainfall.	Temperature.	Rainfall.					Temperature.	Rainfall.	Temperature.	Rainfall.
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
1	26.8	54.4	26.1	2.5	26.5	2.3	27.2	27.2	24.5	27.4	27.4	
2	26.4	1	25.1	10.4	26.6		28.2	28.2	25.1	28	28	
3	26.8	8.6	26.1	.5	26.8		28.2	28.2	24.7	26.7	26.7	
4	27	3.1	27	3.8	27.4		28.6	28.6	24.6	5.1	27.9	
5	27	3.8	25.1	51.6	27	1	28.3	28.3	25.3	27.6	27.6	
6	27.2		25.3	16.5	26.9		27.8	27.8	24.9	28.4	28.4	
7	27.2	44.8	25.9	4.8	27.1	2.3	28.2	28.2	23.8	3	27.8	
8	26.1	41.7	27.3		27.8		28.2	28.2	25	28	28	
9	26	14.1	26.2	11.7	28.1	11.2	28.4	28.4	25.4	12.5	28.8	
10	27.7	32.7	26.6		28.1	28.2	28.5	28.5	25.3	28.8	28.8	
11	28		27.3		28.1		29.3	29.3	25.9	29.2	29.2	
12	28.2		27.4		28.1		29.7	29.7	25.9	28.8	28.8	
13	28.5		27.4		28.3		30	38	26.1	5	29.4	
14	28.5		27.3	4.3	28.1		28.9	1.8	25.7	27.6	27.6	
15	28.1	1.5	27.6	2	27.1		28		25.9	27.4	27.4	
16	26.9	18.8	27.6		27.1	25.9	28.6	3.8	25.7	27.6	27.6	
17	27.4		27.5	2.5	27.1		29.2		26	20.8	27.8	
18	26.5		27.6	2.8	27.7	1	29.4		28	1.9	27.7	
19	27.5		26.6	4.6	26.4	6.4	28		24.9	28.5	28.5	
20	28.4		26.3		27.6	1.8	28.2		26.1	29	29	
21	27.6	12.5	27	2	25.7	4.8	29.8		26.5	29	29	
22	25.4	52.8	23.8	38.4	25.7		28.9		26.1	.5	29.7	
23	26.3		25.8	8.4	26.5	2.8	26.7	15.2	26.1	3.8	28.8	
24	27.3		27.2		27	2.3	26.4	8.8	26.7	22.6	26	
25	27.6		28.2	1.5	27.5	11.2	27.5	29.2	25.9	20.1	26.6	
26	27.5		27.6		27.2		27.8	5.1	26.7	26.6	25.9	
27	27.9		27.6	2.5	27.7		26.5	22.9	25.3	6.4	27.4	
28	26.6		27.2	16.5	28.2		27.8	1.8	25.7	9.7	27	
29	27	.3	28.8		26.5		28.2		26.8	4.3	27.5	
30	26.5	5.9	27.4	1.8	26.2	5.1	28.2		27		27.7	

THE PHILIPPINE *Agricultural Review*

VOL. IV

JULY, 1911.

No. 7

CONTENTS AND ILLUSTRATIONS.

CONTENTS.

	Page.
Editorial	333
The Rinderpest Problem, by Archibald R Ward, Chief Veterinarian.....	337
A Résumé of the Locust Situation, by D. B. Mackie, Agricultural Inspector.....	344
School Farming in Bukidnon, by Lewis S. Thomas	349
Corn-Leaf Blight in the Philippines, by C. B. Robinson	356
Gardening on the Island of Guimaras, by F. G. Lawton, Captain, Nineteenth Infantry	359
Statistics Regarding Corn and Coconuts in the Philippines, by W. D. Hobart, Statist- tician	362
Indian Cattle in the United States, by A. P. Borden.....	366
Animal Diseases in Formosa, by Francis W. O'Connor, American Vice-Consul.....	369
Regulations Relative to Laws of the Netherlands India Governing Importation of Cattle	371
Number of Horses, Cattle, Carabaos, Hogs, Goats, and Sheep in the Philippines	373
Monthly Veterinary Reports—May and June	374
Monthly Crop Reports—May and June.....	376
Notes from Other Fields · Estimated Cost of Laying out a Rubber Estate, Agricul- tural and Trade Conditions of Samoa for 1909, Coconut Butter, Pineapples as a Catch Crop for Rubber, Rubber Conditions in Mexico, The Production of Sugar in Java, A Central Sugar Factory for St. Kitts	380
Market Reports: Notes on Manila Markets, Manila and London Fiber Market, Iloilo Sugar Market	385
Principal Philippine Imports and Exports for April.	388
Temperature and Rainfall for May.....	389

ILLUSTRATIONS.

	Page.
PLATE I. Map Showing the Development of the Corn Industry in the Philippines....	363
II. Map Showing the Development of the Coconut Industry in the Philippines .	365

EDITORIAL.

THE RINDERPEST PROBLEM.

It is probable that many of the readers of the REVIEW, as well as a large part of the general public in these Islands, look upon rinderpest as an affliction from which the Philippines have suffered to a greater extent than any other part of the world. To such as hold this opinion the article on rinderpest by the chief veterinarian of the Bureau of Agriculture, published in

this number of the REVIEW, will be enlightening and of peculiar interest.

This disease which has caused such stupendous losses in these Islands and which is still prevalent in many provinces has existed since the earliest dawn of history. It has been carried across the seas and has swept over practically entire continents, destroying untold millions of animals.

It is well to consider in this connection that the people of the Philippine Islands in their attempt to control and eradicate rinderpest are not facing a new and untried problem, but rather a problem that has been met and that has been solved many times and in many different lands. In other countries where rinderpest has been widespread the disease has been completely eradicated and there is no reason why the same results can not be accomplished in the Philippines.

On the other hand it should be noted that the existing conditions in these Islands are such as to render the complete eradication of rinderpest an exceedingly difficult and possibly a long task. The infection is spread over enormous unfenced areas where the complete control of the movement of domestic animals is neither practicable nor possible. In many localities the people even yet do not fully understand the urgent necessity for loyal and hearty coöperative effort in the work of disease eradication.

That which marks progress in the rinderpest campaign is not so much a lessening of the number of known centers of infection as it is the changing attitude of the people toward this work. Although in some instances the desired result has come slowly there has been, nevertheless, a steady improvement in this direction. Provincial and municipal officials, as well as the owners of live stock, are coming to realize that some temporary hardship is worth the while in view of the final results to be obtained. When this attitude becomes general throughout the Islands and when complaints and *reclamors* are generally superseded by active and intelligent coöperative effort the end of rinderpest will be in sight.

VEGETABLE GARDENS IN THE PHILIPPINES.

A noticeable feature of rural life throughout the length and breadth of the Philippines is the almost utter absence of well-kept vegetable gardens. This condition is particularly unfortunate because of the fact that there are many excellent vegetables that can be grown in almost any part of the Islands. It

is unfortunate, furthermore, for the reason that the daily diet of a large majority of the people is extremely restricted in variety at the present time and would be greatly improved by the addition of the products of a good garden.

It is probably of more interest to consider the means of improving the present situation rather than the reasons why this situation exists. In two different articles in this number of the REVIEW vegetable gardening in the Philippines is discussed at some length by men who have had practical experience in the work. In both of these cases the results, as a whole, that were obtained were highly satisfactory.

The gardener in any land has difficulties to face and obstacles to overcome and in some parts of the Philippines the difficulties may seem to be numerous and the obstacles large. Reports of successful gardening are, however, becoming more and more numerous and as these reports cover a territory extending from the Batanes Islands in the north to Mindanao in the south it appears that good gardens are a possibility in almost any part of the Islands.

It is difficult to overestimate the value of the work that can be and is being done by the Bureau of Education in its school gardens. In these gardens a large number of boys and girls are learning some of the elementary principles of successful agricultural work. The information thus obtained will be widely disseminated and if the work is actively continued and intelligently supervised the school garden may well be the means of bringing about a large increase and a great improvement in the present food supply of the people of these Islands.

THE LOCUST SITUATION.

As the time of year is now approaching when locust swarms may be expected in different parts of the Islands it is important that measures be taken to promptly and effectively fight this pest when it appears. Last year there was a great deal of excellent work done in this direction. In the Province of Iloilo particularly, such an active campaign was carried on against locusts that the methods used in this province were brought to the attention of local Government officials throughout the Islands.

Considerable investigational work has been carried on to determine the best means of destroying locusts, as a result of which it is believed that under existing conditions the most

satisfactory results will be obtained by the use of the common method of driving them into trenches. This method is simple, one with which all of the people are familiar and one that requires no complicated or expensive apparatus. The use of poisons, while effective, is attended with more or less danger in this country and can only be introduced gradually.

The first consideration in the work of exterminating locusts is promptness, and the second is concerted effort. The driving of a swarm of locusts to an adjoining plantation or to the next municipality does not greatly improve the general situation. It is essential, therefore, when locust swarms appear that the people, not only in one locality, but, if necessary, of several adjoining municipalities act together with the end in view of the complete destruction of the pest.

THE RINDERPEST PROBLEM.

By ARCHIBALD R. WARD, *Chief Veterinarian.*

Rinderpest is primarily a disease of Asia. It is distributed at present from the China Sea to the Urals and the Black Sea. It has existed in that continent from the time of writing the earliest authentic records to the present moment. The spread of no other animal disease is so closely identified with great migrations of peoples, war and commerce, as is rinderpest. There are precise accounts of the appearance of the disease in Europe from time to time during the past fourteen hundred years. It was spreading westward from the banks of the Don and Volga at the time Theodosius in Constantinople was repulsing the Goths. Charlemagne took the disease back to the territory now known as France after his expedition against the Danes in 810. It is thought probable that during the known history of the disease a period of fifty years rarely elapsed without a visitation of some portion of Europe.

In the later centuries, data is available concerning the losses. In the second half of the eighteenth century it carried off 200,000,000 head of cattle in Europe. During the Napoleonic wars it caused unheard of losses through Europe. The last invasion of England occurred in 1865-66, when in eighteen months 279,023 head were reported as attacked, of which 40,165 recovered.

It should be emphasized that the conditions in Europe during these periodic invasions were such that the disease either burned itself out for lack of susceptible animals or was controlled by sanitary measures after each invasion. The disease did not gain a permanent foothold, and the historic facts bear evidence to the truth of the fact that it is a disease that can be exterminated in any given area. The losses in Europe in ancient times were due to introduction of disease from the great reservoir of rinderpest, the vast unfenced areas of Asia, where the disease constantly exists among the herds roaming therein. In

Europe, where the movement of cattle is restrained, the disease gained but a transitory foothold.

The demands of commerce, rather than war, have resulted in the infection of the Philippines by importation of cattle from Hongkong, and only a year ago were those demands denied by measures designed to exclude the disease. Until that time efforts to control the disease here were of necessity futile.

The experience of ages has demonstrated that the disease can be exterminated by preventing the intermingling of sick or suspected animals with the well; by the slaughter of the sick and exposed, together with thorough disinfection. By these methods Europe has been rid of the disease.

During the past fifteen years a great deal of effort has been exerted toward controlling the disease with antitoxic serum. This serum has been employed extensively in Asia, Africa, and in the Philippines. A critical study of the results that have attended its use here and elsewhere has led to the abandonment of this means of combating the disease here. It is not possible to ascribe to serum the credit of exterminating the disease unaided by other measures in a single country where it has been used. Rinderpest is a disease that must be fought to extinction.

In all fenced countries, rinderpest is successfully combated by slaughtering all of the sick and the exposed cattle in contact with them. In such thickly settled countries, the problem of discovering infected herds is comparatively simple, as is likewise the matter of determining what animals are really exposed. Under the conditions existing in the Philippines, the determination of these facts is one of extreme difficulty. The offer of compensation to owners of sick cattle slaughtered by no means always results in cases being voluntarily reported by the owners.

There is frequently cherished a hope that the animal will survive the attack. Furthermore, the carabao is frequently a family pet and there is a strong sentimental objection to its slaughter. Where slaughter has been employed in the Philippines, it has been noted that sick cattle have in general been reported only when on the verge of death, a time when they have done practically all the damage possible in the way of disseminating disease. Under such conditions the contact animals are hopelessly scattered by the owners in order to avoid quarantine restrictions. Under any circumstances it is practically impossible to determine the contact animals.

Slaughter has so far been employed to a limited degree under practically experimental purposes to determine its efficiency.

The present methods of controlling rinderpest employed by the Bureau of Agriculture, are centered about the task of finding the sick and of keeping separated from one another the various animals which are susceptible to this disease. These include cattle, carabaos, sheep, goats, and possibly pigs, under certain conditions. Inasmuch as the disease is prevalent in seventy-one municipalities in twenty provinces in these Islands, the task has to be taken up piecemeal. While the fundamental principle of the campaign is simple, it is by no means a simple task to enforce the separation of animals under the conditions existing in the Philippines. It is not too much to claim that the task of eradicating rinderpest here is one that has no successful precedent under similar conditions elsewhere. In the unfenced countries of Asia the disease flourishes to-day as it has since the writing of the earliest records. The Island of Luzon constitutes the most difficult problem on account of its size and the overland movement of cattle and carabaos. There is an extensive movement of cattle from the Province of La Union and territory northwards and from the mountains in the western portion of Pangasinan southwards as far as Manila. This is a movement of cattle from the prosperous breeding districts to supply losses in the great central valley. Besides this, there are extensive trade channels permeating the provinces between Ilocos Norte and Rizal. The movement of animals is further intensified from the fact that there is the seasonable movement of work animals from one part of Luzon to another, depending upon crop harvesting, planting, etc. Persons familiar with the customs of the country need not be told that this movement of animals through Luzon goes on without reference to roads, trails, or bridges, and is, if anything, more active at night when the difficulties of preventing movement are intensified. The difficulties of controlling the movement of animals by sea are likewise serious. It is the common practice to ship animals from place to place in the Islands on very small boats, which are subject to no official regulation. Our quarantines have been evaded by shipment of animals by water on the Gulf of Lingayen and on Manila Bay. In a work of this character it is expected that opposition will be encountered which has its origin in both ignorance and deliberate, willful violation of regulations. A campaign of education is being carried on, but its progress is hindered by the difficulties imposed by the differences of race, habits of thought, customs and languages of the people who own the cattle and the people who are fighting the disease.

The theoretically perfect ideal in a task of this character

would be to prevent absolutely the movement in an infected community of all animals of the classes mentioned above, for a period of fifteen days after the last case discovered. Such a measure is of course impossible in an agricultural community at the time of harvesting or planting of crops, for its enforcement would cause staggering losses. The measures, then, represent the compromise between the complete suspension of the movement of animals and of the unrestricted movement of animals. The past system permitting the use of work animals under certain conditions represents the mean between the two possible extremes. How important a matter this question of the issuing of passes becomes is well illustrated by a passage from Gamgee's work on this disease written in England in 1866:

Any plan which, while laying down the general prohibition, admits exceptions in favor of cattle removed to particular places or for particular purposes, must rest upon the ascertainment of facts more or less complicated, to be proved by certificates from local authorities upon the accuracy of which, experience warns us, little reliance can be placed. The liberty to remove cattle for particular purposes is sure to be extended and abused for other purposes. A man has only to proffer an intention in accordance with the law in order, by a little dexterity, to obtain under such a system the utmost facility for violating the law. It will be a long time before the rules are understood, and the period through which they are violated through ignorance will be succeeded by the period in which they are evaded by design. England is probably the worst country in the world for the working of a system of certificates, permits, licences, and passports; and the temptation to violate the rules will be very great, for the thought that naturally occurs to every one whose herd is attacked is to conceal the existence of the disease until he has got rid of those animals which do not yet show symptoms of its presence.

Substitute the words "Philippine Islands" for "England" in the above quotation and we have an expression of the difficulties encountered in the present campaign. I quote this to show that whatever dissatisfaction I may express concerning difficulties in accomplishing our measures these obstacles are not peculiarities of the Filipino people, but are characteristics of livestock owners and dealers the world over.

The infection is so widespread in Luzon that it is possible only to undertake measures of complete eradication in the Province of Pangasinan. This is one of the fourteen infected provinces of this island. The campaign in Pangasinan has been made possible only through the hearty coöperation of General J. Franklin Bell, who has placed extraordinary facilities at the disposal of the Bureau of Agriculture. There are on duty in this province a total of forty-one American soldiers, one thousand one hundred and thirty-six Philippine Scouts,

forty-five Scout officers, and two quartermaster veterinarians, all borrowed from the Army. The Bureau of Agriculture has supplied nine veterinarians and one hundred and eighteen inspectors.

Through the use of the Scouts there is being achieved the combination result of a police patrol (which is an indirect quarantine) and an inspection of animals for evidence of disease. The Scouts are being educated as to the nature and symptoms of rinderpest so that they will be able to diagnose cases, and also are being instructed in the quarantine regulations for their guidance in the quarantine side of their duty. When the Scouts encounter an infected or suspicious animal, they hold the animal until an inspector arrives, who at once assumes the responsibility of diagnosis and disposal of the animal. In patrolling, the soldiers are instructed to move in pairs so that in case they find an infected animal one may mount guard over him until the other returns with an inspector.

At the beginning of the work all newly appointed inspectors were sent to a training school in Lingayen in groups of from ten to twenty-five and were held there until the instructor in charge decided that their knowledge was sufficient to enable them to act intelligently alone. The method of instruction was to conduct them to the corral so that they might see the various stages of the disease and assist at autopsy. They accompanied the trained inspectors during their inspection trips, becoming familiar thus with work both in clean and infected barrios, assisting in taking of animal census, corralling of animals, etc. Evenings were spent in the class room, where the instructor lectured on the laws and regulations, taught them how to make out necessary papers in the proper manner, made them all understand fully the policy of the Bureau and the best methods of getting information, and, in general, discussed with them the obstacles they might be expected to encounter in rinderpest work. The last two days were spent in demonstrating the knowledge of the different appointees by asking questions as to what they would do under certain conditions, and receiving recitations.

On May 13 rinderpest was known to be present in thirty municipalities in Pangasinan with a bovine population of 54,364 animals. Of these, 4,865 were actually in quarantine, a total of 8.9 per cent of the bovine population of the thirty infected municipalities. Figures are available to show that on May 20 there were fifty barrios of the province in quarantine. The total number of barrios in the province is estimated to be

between eight and nine hundred. These figures are quoted to illustrate the truth that the quarantine measures employed in Pangasinan are by no means as paralyzing to agriculture as has been represented. It should be noted that there has been interference with agricultural operations only in the fifty quarantined barrios or portions thereof. That the interference has not been oppressive is shown by the fact that it will be several weeks yet before it is essential that plowing be commenced in Pangasinan.

During the opening weeks of the campaign in Pangasinan the increase in the number of trained men, capable of recognizing the disease, simply increased our list of known infected municipalities. This is a circumstance which I wish to emphasize as illustrating our difficulties in locating infection. After a search which has resulted in showing that practically every municipality in the province was infected the tide has turned and our efforts are now bearing fruit in clean territory. On the 20th of May nine municipalities in the eastern part of the province were released from any restrictions whatever, although inspection work is being continued. In connection with the difficulties in discovering disease it should be emphasized that much unrecognized infection is believed to prevail throughout the territory between Pangasinan and Rizal. This whole stretch of territory is believed to be in a condition differing in no way from that which the search of Pangasinan exposed.

In the Visayan Islands there are only six known infected municipalities. The situation is highly encouraging. Two known infected municipalities in Mindanao raise the total of known infection south of Luzon to eight municipalities. Four hundred Scouts have rendered inestimable service in Oriental Negros during the past two months.

In all of the infected provinces of the Archipelago, the Philippines Constabulary are rendering valuable aid up to the limits imposed by the available men.

The work of the Bureau against rinderpest may be regarded as of two classes: First, palliative measures with the insufficient forces, resulting in widespread benefit throughout the infected areas by lowering the losses; second, systematic efforts at utter extinction of infection.

Under the most favorable conditions, extinction of rinderpest in the Philippines will involve years of work, with occasional heartbreaking setbacks. In this connection the magnitude of the task can best be illustrated by reference to unprejudiced writers elsewhere. The British Royal Commission appointed to inquire

into the origin, nature, etc., of rinderpest, occurring in England in 1865, writes of rinderpest in England as follows:

Against a disease which is highly contagious, undiscoverable at a certain stage, and too widely diffused for an army of inspectors to cope with it, there is clearly but one remedy which will be certain and absolutely effectual. That remedy is to prohibit everywhere for a limited time any movement of cattle from one place to another. Enforce this and within a time which can not last very long the disease is at an end. It must stand still and must starve for want of nutriment. This great sacrifice would certainly eradicate the evil; we can not say so of any sacrifice less than this.

We are perfectly sensible of the vast train of losses and inconveniences, public and private, which must attend upon such a measure; and the possibility of mitigating them by circumscribing a prohibition in different ways without rendering ineffective is a point to which we have given most anxious consideration. * * * We are perfectly sensible that this is a question of extreme difficulty. The difficulty lies in the magnitude of the sacrifices we have to call for, the inadequate notion which prevails of the extent of the evil to be subdued, the facilities for dishonest evasion and the risks from inadvertence which spring up from every attempt to mitigate those sacrifices. For it must be observed that we have not merely to guard against criminal or unscrupulous acts; nothing is easier than for a man, without being guilty of so much as gross negligence, to become the means of spreading the infection over the whole country.

England has now to contend with the rinderpest under disadvantages never experienced by any other country. The density of her population, the large quantity of her horned stock and above all the enormous facilities of communication by railroad make her peculiarly liable to the ravages of a contagious disorder and render the prospect of eradicating it within any reasonable time either by slaughter or by curative or disinfecting measures almost hopeless.

Notwithstanding the pessimistic tenor of the last sentence the disease was eradicated from England within eighteen months of its recognition and that country has since remained clean.

Professor James Law an authority on the subject, makes the following statement regarding the Philippines in his text-book of Veterinary Medicine:

On the unfenced land of these Islands we have to face on a smaller scale the problem of stamping out the plague which has baffled the wisdom of Europe and Asia. * * * But whatever method is adopted the seclusion of all within well-fenced areas is the most important consideration. No nation has ever succeeded in extirpating this nor any other important infection in animals when they are allowed to run at large and mingle freely, herd with herd, on unfenced land.

All of this is quoted not in a spirit of pessimism as to the outcome of the determined effort against the disease now being carried on in the Philippines, but with a desire to furnish the public with accurate information regarding the present rinderpest situation.

A RÉSUMÉ OF THE LOCUST SITUATION.

By D. B. MACKIE, *Agricultural Inspector.*

The purpose of this paper is to record conditions relative to the appearance of locusts in the Philippine Islands. Ever since the organization of the Bureau of Agriculture reports have been received each year relative to the damage done by these insects, and experience has led provincial officials to the conviction that the provinces would be mutually benefited if the work were centralized and placed in the hands of the Insular Government.

The great advantage which a central power would have in combating the pest, as against many provinces working independently, is universally conceded. In this way the same laws would be made applicable to all provinces, and the present evil of swarms allowed to mature by reason of the negligence of municipal and provincial officials of one province and later invading adjoining provinces, which have been kept clean only by hard and conscientious work, will be eliminated. To combat the pest intelligently and successfully, it is necessary that much more knowledge be gained regarding the origin and migration of invading swarms.

The first step taken by the Government to control the locust plague was the passage of Act No. 817 in August, 1903, authorizing and providing for the appointment of locust boards in each province, with full power to call upon all able-bodied inhabitants thereof to take united action to suppress the pest. However, at that time the Islands were subjected to a severe epizootic of rinderpest and all available funds were used to combat that disease. The congressional relief fund was no longer available for fighting locusts and the matter of locust extermination was dropped to give the necessary attention to the more important cattle plague. As the cattle plague continued for the next five years, little was done to mitigate the locust pest, although letters requesting information, and help to destroy the locusts, were received each year during the locust season.

During the season of 1909 the reports of the loss of crops by locusts were very numerous, and in September of that year the Bureau conducted a series of experiments (THE PHILIPPINE AGRICULTURAL REVIEW, April, 1910, "An Investigation of the Locust Pest in the Philippines") to determine the value of methods recommended by other countries, which are periodically subject to invasion by these insects. For those who have not read the above-mentioned article, it may be said that the different methods were all more or less successful, particularly the arsenical spray recommended by the South African Central Locust Board. This mixture is very efficient as a killing agent, and if the people would exercise more care in looking after their live stock, while the poison is being used in the vicinity, it could undoubtedly be used to advantage in the Philippines.

After all of these methods have been tried there are many factors which lead us to believe that, if a concerted campaign were conducted against locusts in these Islands, the native method of driving them into trenches would prove the most satisfactory. The following may be said for it: First, It is the method in vogue and the people all over the Archipelago are familiar with it; second, it is simple; third, it is economical; fourth, a supply of sheet iron may be kept indefinitely.

It was not until 1910 that any active campaign was waged against locusts. Shortly after the publication of the above-mentioned article, the Governor-General issued a circular calling attention to the law of 1903, making the destruction of locusts compulsory, and called upon provincial governors to see that the law was enforced. Although many provinces were short of funds and without material, the manner in which they responded was very commendable, and it is safe to say that during the season of 1910 there were more locusts killed in the Philippine Islands than in any two years preceding.

The reports received have been of great value; from them we have been able to ascertain the number of provinces invaded, the areas of greatest infestation, the apparent movements of invading swarms, the equipment of each province for fighting the pest, and the central points where such material may be stored so as to be readily available in case of an outbreak. It is to be hoped that reports for 1911 will continue the accuracy and completeness which marked those for 1910.

During the past year locusts have appeared in the vicinity of eighty-four towns and barrios of the Archipelago, and in the majority of cases they were destroyed. Reports show the

area of greatest infestation to be a broad belt extending from Romblon to Bohol and including Romblon, Antique, Iloilo, Capiz, Occidental Negros, Oriental Negros, southern Cebu, and Bohol, and the flying swarms to be moving in a northeasterly direction traveling with the southwest monsoon.

The Locust Act, by which the destruction of locusts is made compulsory, has been in many cases severely criticized. It may be of interest to those who criticize it to know that of all the countries which are periodically visited by locust swarms and other noxious insects, there are few of any importance where legislation has not been enacted. Even the Barbary States have enacted measures to regulate this pest. The following list of countries in which locust extermination is regulated by law will convey a better idea of the importance of this matter in the eyes of the leading governments of the world: Dutch East Indies, Australia, Cape Colony, Transvaal, Orange Free State, Portuguese East Africa, Algeria, Morocco, Egypt, Turkey, Austria-Hungary, Argentina, Brazil, Mexico, and the United States.

Provinces and towns reporting locusts in 1910.

Provinces and towns.	Date.	Kind
ALBAY.		
Oas	February 6	Fliers.
Manito	September 7	Locusts.
Polangui	December 16	Do.
Libon	do	Do.
Legaspi	December 12	Fliers.
AMBOS CAMARINES.		
Nueva Caceres	August	Young hoppers.
Nabua	October 18	Fliers.
ANTIQUE.		
Bugasong	June 28	Fliers and hoppers.
Culasi	do	Do.
Dao	do	Do.
Lana-an	do	Do.
Pandan	do	Do.
Patnongon	do	Do.
San José	do	Do.
San Remigio	do	Do.
Sibalom	do	Do.
Tibiao	do	Do.
Valderrama	do	Do.
BATANGAS.		
Alitagtag	October	Fliers.
Bauan and barrios	do	Do.
Cuenca	do	Do.
San José	do	Do.
Taal	do	Do.
Lipa	do	Do.
BOHOL.		
Bilar	September to December	Do.
Sierra-Bullones	do	Hoppers.

Provinces and towns reporting locusts in 1910—Continued.

Provinces and towns.	Date.	Kind.
CAPIZ.		
Dao and barrios.....	June.....	Fliers.
Looc (Romblon).....	do.....	Hoppers.
Nabas and barrio.....	do.....	Fliers.
Odlongan (Romblon).....	do.....	Hoppers.
Panitan and barrio.....	do.....	Fliers.
Pilar and barrio.....	do.....	do.
Pontevedra and barrio.....	do.....	do.
Sigma and barrio.....	do.....	do.
Tapas and barrio.....	do.....	do.
CEBU.		
Bantayan.....	May 5.....	do.
ILOILO.		
Cabatuan.....	March.....	Hoppers and fliers.
Dingle.....	do.....	do.
Guimbal.....	do.....	do.
Januay.....	do.....	do.
LA LAGUNA.		
Cavinti.....	August.....	Fliers.
Lilio.....	do.....	do.
Luisiana.....	do.....	do.
Magdalena.....	do.....	do.
Majayjay.....	do.....	do.
Nagcarlan.....	do.....	do.
LEYTE.		
Palo.....	September.....	Locusts.
Tacloban.....	do.....	do.
MINDORO.		
Palanan.....	July 20.....	do.
San José.....	do.....	do.
MORO.		
Biuang Coast.....	May.....	do.
do.....	November.....	Fliers.
OCCIDENTAL NEGROS.		
Bacolod.....	June.....	Hoppers.
Valladolid.....	do.....	do.
La Carlota.....	do.....	do.
Silay.....	do.....	do.
Manapla.....	do.....	do.
ORIENTAL NEGROS.		
Bacon and barrio.....	January to July.....	Fliers and hoppers
Dauin and barrio.....	January to February.....	Fliers.
do.....	March to July.....	Hoppers.
Dumaguete and barrio.....	January to February.....	Fliers.
do.....	March to July.....	Hoppers.
Luzuriga and barrio.....	January to February.....	Fliers.
do.....	March to July.....	Hoppers.
Manjuyod and barrio.....	January to February.....	do.
Siaton and barrio.....	March to July.....	do.
Tanjay and barrio.....	do.....	do.
Tayasan and barrio.....	do.....	do.
Zamboanguita and bar- rio.....	do.....	do.
SAMAR.		
Almagro.....	May to October.....	Fliers.
Calbiga.....	do.....	do.
Gandara.....	do.....	do.
Santa Rita.....	do.....	do.
Villareal.....	do.....	do.
SORSOGÓN.		
Masbate.....	June 25.....	Hoppers and fliers.
Milagros.....	June 28.....	Hoppers.
do.....	June 25.....	Fliers.

Provinces and towns reporting locusts in 1910—Continued.

Provinces and towns.	Date.	Kind.
TARLAC.		
Paniqui	June	Hoppers.
TAYARAS.		
Alabat	August 23 to September 21..	Fliers.
Antimonan	September 3 to 9	Do.
Calauag	August 8	Do.
Candelaria	September 8 to 20	Do.
Dolores	September 1 to 7	Do.
Guinayangan	August 6, 21, and 23	Do.
Lucena	September 14	Do.
Lucban	August 23	Do.
Mauban	August 17 to 20	Do.
Polillo	September 1, 5, and 18	Do.
Suriaya	September 6 and 16	Do.
Tayabas	August 20 to 23 and 29	Do.

The following provinces have not reported any damage done by locusts: Agusan, Bataan, Bulacan, Cagayan, Ilocos Norte, Isabela, La Union, Batanes, Misamis, Mountain, Nueva Vizcaya, Palawan, Pangasinan, Rizal, Surigao, and Ilocos Sur.

No reports have as yet been received from the following provinces: Cavite, Nueva Ecija, Pampanga, and Zambales.

SCHOOL FARMING IN BUKIDNON.

By LEWIS S. THOMAS.

From the time of the establishment of the first schools in the subprovince of Bukidnon, agriculture has been recognized as the form of industrial work most to be emphasized in the course of instruction. The existing conditions have been particularly favorable for this work. Land of good quality and in abundance has been available, and there has been, furthermore, a great need for an increase in the food supply. The schools have been able to take up enough public land to make practical farming possible, and the force of hunger has assisted materially in bringing about coöperation and expenditure of energy by the pupils. What was most needed was a broadening of their view, and the teaching of larger ideas in farming. The people were accustomed to plant their crops in clearings in the woods without any attempt at order or even cultivation. In the establishment of this work there has been, as was to be expected, a certain amount of inertia to be overcome.

The first attempts at school farming in Bukidnon were necessarily limited in extent. The pupils had first to gain that confidence in the value of their own endeavors without which no people can do work that will be of permanent value. After this came instruction in the way to plant, some use of fertilizers, a little instruction as to the value of the rotation of crops, and a great deal in the importance of order, discipline, and pertinacity. There was set aside for agricultural work a period of forty minutes of each day, preferably in the morning, since that time was cooler. To encourage the pupils the gardens were first cut up into small beds from which each pupil received the products of his own labor. From this grew the system of communal work in breaking the land. The gardens were laid out in rows of beds, with each pupil's land marked by rows of gabe. In this way the industrious pupils received the benefit of their labors, the fields had a more regular appearance, and practical

demonstration of work on a large scale was given, not only to pupils but also to whomsoever chanced to pass.

As a means of breaking the land, the adze hoe, called in the vernacular "bincong," was found to be the most useful implement. This work was given over to the larger boys, working in relays. The smaller boys followed with crooked sticks, breaking the clods and taking out the cogon roots by hand. At Tangculan, Maluco, Impasugong, Kalasungay, and Malabalay considerable land was plowed with a disk plow. In Dalirig, Impasugong, Bugcon, and Sumilao the people assisted with their own animals, sometimes doing the work without recompense, in others doing it for the privilege of using the plows and harrows which belonged to the schools. In all cases, however, the land had to be worked over behind the plows by hand. It was attempted to manage the work of breaking the land so that only enough was broken to be handled easily by the children. With this end in view newly broken land was planted to rice. After the harvest, this land was cleaned and re-worked, and planted to some crop that aided in the disheartening labor of keeping the weeds down. New land was then broken and the following year all was planted to rice. Thus the interest was kept alive, since the children were more interested in a rice supply than in anything else. In order to be able to handle the land well and to plant permanent crops, the farms were laid out in rows 2 meters in width, separated by paths 1 meter in width. Down the middle of these paths were planted the rows of permanent crops and the requisite shade. This plan made it possible to keep the permanent crops clean and left room enough to plant food crops. The permanent crops most in evidence are coffee and cacao. Coffee was planted at intervals of 3 meters. Shade was planted in the proportion of one shade plant in every four, so arranged that the rows of shade run diagonally across the land. Bananas were planted in between the hills of coffee and cacao. For the youngest plants it was found that the best shade was that produced by planting camoteng cahoy at each tree. The trees that grew under this shade flourished with a rich green color of leaf. The principal shade was gauí-gauí, a legume which is very plentiful in this section. This plant is easy to grow since the branches may be cut into small pieces which take root readily. All the coffee seeds were sprouted in the school seed beds.

Of the crops grown the principal one, of course, is rice. Attention has been paid at the same time, however, to teaching the cultivation of various other crops. A considerable plot is always reserved for camotes, planted at such periods that

the land may be cleared in time for the rice planting. The growing of cowpeas has been encouraged until they are now beginning to form a part of the diet of the people. At every harvest all of the cowpeas that are not required for seed are distributed among the boys for their personal use. Attempts have been made at growing peanuts, but the soil contains too large a proportion of clay for the best growth of this crop. After one season's cultivation, however, the soil becomes more loosened and the peanuts then do much better. Camoteng cahoy is planted in large plots, as camote, and is also used wherever there is coffee to be shaded. It supplies an article of diet much appreciated by the pupils. Some arrowroot was planted this past year and the plants are now beginning to show up. The use of this product will, however, need instruction. Bananas are planted at all times. Each tract of land contains approximately 4 hectares and has three rows of bananas around it. The variety called sabá is the one most used. This banana has a bud that can be used for "greens," the fruit can be cooked, and the fiber is of great value for weaving. Moreover, it grows rapidly and serves as a windbreak. Considerable ginger was planted on one farm, the ordinary wild variety being used; it was dug up out of the cogon and planted out so that it might have a chance to develop. A kind of small bean common to this section, called "balatong Moro," was planted as a temporary windbreak and for shade. This variety grows like a tree, will stand at least two seasons, and produces abundantly. For camotes the variety called, by the Bureau of Education, "Beattie camote" was the most popular. This camote is large, of excellent flavor, and has a strong vine.

So much for the native crops. In the crops of improved seeds and foreign vegetables about every kind was planted. Okra grows almost like a weed, but the people do not seem to appreciate it as an article of diet. One thing to be noted in all of the work was that the cultivation and care of a crop varied with its possibilities as a readily cooked and well-known article of food. Cabbages were planted, but the care necessary to their proper development was lacking, since there was so much that could be done with crops that were better known. Large tomatoes were planted in quantities at all of the schools. The degree of success with this crop varied according to the time of the year when planted. Large tomatoes must be planted so as to be ripening as the rains diminish, otherwise they rot on the vines. Lettuce has always been a popular crop on account

of the ease with which it is grown, but the people need a food that does not cost so much to garnish. Beans were one of the most satisfactory crops planted. All varieties but the Lima flourished and much seed was secured. Kalasungay raised some excellent peppers of the large kind and the garden won fame because of the appearance of this crop. Pechay did well and took the fancy of the pupils. Beets were not as successful as might have been expected. Radishes, especially the white Chinese varieties, grew prolifically and gave large quantities of seed. Carrots grow well and have a fine flavor, but do not produce seed. Squashes of the native kinds have been planted around in the corners and wherever there happened to be room. American sweet corn was planted but did not flourish. Every garden produced good crops of the native flint corn which seems to be the best adapted to the peculiar means of preparation for food in this locality. Mexican June corn was secured from the Bureau of Education and planted at Tangcunan in March. The sweet ears proved to be too much of a temptation to the dogs of the town which robbed the garden continually in spite of all precautions. Some ears were, however, saved.

Guinea grass proved to be a crop well worth growing. It formed the principal source of revenue for as many schools as were able to get a stand started. Nearly every school now has enough guinea grass to supply any travelers and to feed such stock as may be engaged in doing work on the school farm. At Malaybalay a package of seed was planted in the middle of the dry season and from this came enough to make a stand of over one thousand hills for that school and enough to start those of every other school except Tangcunan.

Pineapples from a selected variety furnished in 1908 by the Bureau of Agriculture have furnished seed for every other school in the district. No opportunity has been had to test the fruit on account of the hunger which drives the people to appropriate them before they have ripened. Wherever it appeared that pineapples were peculiarly adapted, this fruit has been planted in hundreds and with some attention to regularity and ease in harvesting.

Maguey at the Malaybalay School, also furnished by the Bureau of Agriculture, is almost ready to cut and has supplied many plants for the other schools. At the beginning the maguey plants did not grow well, but the burying of bones around each plant seemed to give them what was required.

Sugar cane was planted in quantity this year for the first time in the expectation of beginning some instructions in making

sugar. Up until now the principal, and in fact practically the only, use for sugar in this subprovince has been for making a sort of cider or tuba from the juice and the distilling of a peculiarly fiendish kind of spirits.

Consistent attempts have been made to cultivate American cotton. Of course one difficulty with the successful production of cotton as a commercial crop is the lack of gins. The rains, which have been almost continuous since 1908, have tended to rot the bolls long before they were ripe. The native variety of cotton, known as "gapas Moro," has been planted, but the harvesting has not been conducted as regularly as it should have been to give results. Enough cotton has been gathered at various times to make it possible to begin spinning, but each time some branch of the Government has called for collections of agricultural products and the cotton has been sent. It has been suggested that some of the buds of the American variety be grafted upon the stalk of the native variety, but other more important matters have demanded more immediate attention.

There have from time to time been opportunities to secure seeds from oranges grown by the Jesuit Fathers at Sumilao. These have invariably been saved and given to the teachers to plant, with the result that there are now a few trees of this variety growing. The lieutenant-governor presented the schools with a number of Batangas orange trees of a year's growth which are also growing in several schools. The Jesuit Fathers have also a variety of lemon which makes a good close tree. These have been planted with the intention of making hedges. The school at Malaybalay has one hedge of this kind.

Benguet pine seed was secured from the Director of Forestry. These trees grew well but did not endure transplanting. The only ones left are in Kalasungay where some three hundred were once counted. These are, however, dying in spite of every effort.

A quantity of other shade and ornamental trees were also secured from the Bureau of Forestry. All but the fan palm grew and were used in Arbor Day celebrations in decorating the plazas of the towns. In Kalasungay there are still some excellent saplings in the nursery. The *Lebbeck albizzia* did not grow as well as was expected. The fire trees did well and all that were planted are flourishing.

Rubber of the Ceara variety was planted during the long vacation to the number of over 1900. Some 200 were transplanted from the beds to the plazas. While this may not be the best variety of rubber, it makes an excellent shade tree and is ornamental. It also grows rapidly. Some Pará rubber seed was

sent to the district. As usual, transportation facilities delayed the receipt of the seed until it was certain that some were spoiled. All were planted, however, in Alanib, where the number of gutta-percha trees promised the best results in rubber planting.

Kapok has been planted continually. During the last long vacation there were planted some twenty packages of seed both in seed beds and along the fences. Many of the older trees are now being cut into posts for a barbed wire fence at Maluco. There has always been enough kapok for Arbor Day plantings.

Lanzone trees were planted at Sumilao and the nursery has been used as a means of giving presents for regular attendance. Mangos have been planted whenever anyone was so fortunate as to get a ripe fruit.

"Tangan-tangan," or castor bean, can be seen in quantities in almost every garden. It was planted first for its value as shade but later to furnish food for the larvæ of the species of silkworm which feeds upon the leaves of this plant. The larvæ, however, have not as yet been received.

Large papayas have been plentiful in the school at Tangculan. From this school the seed has been scattered pretty well over all the districts until every town now has some young trees of the large variety growing. Crows, high winds, and the taste of the people for green fruit are things to be combated in the cultivation of the papaya.

Besides these practical plants some experimental work has been done with tobacco. Sila-i, Imbasugong, Alanib, and Puntian have hills of tobacco that are being cultivated under the direction of the teachers, who, while not being experts in this work, have more knowledge of this crop than the natives of the district.

Flowers have not been omitted. No school is without its bed of flowers more or less well and artistically arranged to lighten the monotony of the cogon. Around the flag poles are banked the red and gold on the dark green of the Spanish flag, while walks, paths, and grounds are edged with the flaming colors of many a variegated leaf. Some American flower seeds of perennial varieties have been planted and are growing well.

As results of the work done there may be mentioned as chief, the increase in the number of gardens among the townsfolk. The manner of doing the work has borne fruit in the better arrangement of plantings and economy of space visible to anyone who may pass through the towns where schools have been established. Many times pupils have been fed for days from

the products of the farm. When the baseball teams play in neighboring towns the hosts supply the camotes from the farms and the girls prepare the food for the visitors. In all of this movement the Filipino teachers assigned to work in the district have been the means of encouragement. In not a single case has a teacher shown laziness. Their work has been consistent and at the same time the academic branches have not suffered.

With the addition of four good bulls to the equipment there promises to be a more thorough system of cultivation, since the work will go on more rapidly and such experiments as burying the rice straw can be done with much less labor. Altogether the school farms of the district of Bukidnon may be taken as an answer to all critics of the Bureau of Education, for here is to be seen, perhaps in a most favorable light, the results of the plans of the Bureau, favorable because here are the conditions most suitable to practical agricultural work.

CORN-LEAF BLIGHT IN THE PHILIPPINES.

By C. B. ROBINSON, *Bureau of Science.*

On July 5, 1910, there were sent to the Bureau of Agriculture, three leaves of maize, *Zea mays* Linn., attacked by some disease. They came from Sagada, in the Mountain Province, and were transmitted by Señor Jaime Masferré, who supplied various particulars regarding the appearance of the disease.

On April 13, two sowings were made of the imported variety of maize known as "Mexican June," in two lots of ground, neither good, one fertilized with cow manure, the other not fertilized. The growth was slightly greater in the fertilized plot, but much more rapid. The disease was more conspicuous in the fertilized plot, but varied within it, although present to a greater or less extent everywhere. Where the plants were crowded, the intensity of the disease was greatest; where they were less densely crowded, and exposed to open sunlight, it was least.

The specimens were forwarded to the Bureau of Science for identification, but as the disease had not previously been met with in the Philippines, they were submitted by Mr. E. D. Merrill to the Bureau of Plant Industry, Washington, District of Columbia. The report upon them, by Mr. G. H. Powell, is as follows:

The leaves are badly blighted by a fungus, *Helminthosporium inconspicuum*. A similar, if not identical, fungus has been described from Europe as *Helminthosporium turcicum*.

Infection takes place through the stomata. Usually the disease does not appear till the corn is well advanced, though seedlings may be attacked. The trouble is characterized by a wilting of the leaves due to the growth of the fungus in the tissues. Elongated dead spots are formed, sometimes comprising almost the entire blade. On these the sporophores and spores appear, forming a dark hairy growth visible to the naked eye.

Rotation of crops is recommended as a preventative; also the manure made from diseased corn should not be used on land intended for corn.

Additional notes, furnished by Señor Masferré, showed that in the first sowing, which was dense and well fertilized, the disease appeared when the plants were still young, but had already attained a height of 1.5 meters. Believing that the disease was favored by deprivation of light through too close planting, or by the manure, the plants of the second sowing were placed farther apart, and no manure was used. In this second case, the disease was slower in appearing, but at the same stage in the growth of the plants, namely, when they were about 1.5 meters high; but, once it did appear, was of greater intensity than in the preceding case.

A third sowing was made in poorer soil, and at very short intervals. The disease appeared when the plants were about 60 centimeters high, their growth was in general poor, and no crop was obtained from them.

From the second sowing but a small crop was obtained, but in the first, the plants, although attacked as already stated, continued to grow, and yielded a good crop of large ears, some of which attained a length of 25 centimeters. It was calculated that the disease reduced the crop by one-half. The common maize of the region was also attacked, but to a less extent.

Hitherto *Helminthosporium inconspicuum* C. & Ell. has not been reported except from the United States. In that country, it was noted as destructive as far back as 1889. From 1903 to 1907 it is frequently mentioned in reports,¹ doing damage, often serious, in the States of Delaware, Maryland, Pennsylvania, New Jersey, Connecticut, Ohio, West Virginia, Georgia, and Vermont. However, mycologists seem agreed that it is at least almost identical, both in its appearance and in the nature of the disease produced by it, with *H. turcicum* Pass., of southern Europe. Clinton² definitely reduced it to the latter.

It would naturally be suspected that a species of fungus, hitherto unknown in the Philippines, appearing for the first time on an introduced variety of corn, must have been imported at the same time as its host. In the present case, there are two objections to this view. First, the "Mexican June" was grown at the Singalong experiment station, Manila, for two

¹ See Yearbook U. S. Dept. Agric. 1903, 554; 1904, 585; 1905, 608; 1906, 505; 1907, 585; Bull. Del. Coll. Agric. Exp. Sta., 63 (1904) 19-25, pl. 1, 2; Ann. Rep. Vermont Agric. Exp. Sta., 17 (1905) 385.

² Rep. Conn. Agric. Exp. Sta. 28 (1905) 317.

years, and no disease was noted upon it. The seeds sown at Sagada were from these Singalong plants.

Again, *Helminthosporium turcicum* has recently been reported from Japan.¹ It is therefore quite possible that the species may have been introduced through natural causes. Very great care will have to be taken to prevent its spread in the Philippines, as the results might be very serious.

¹ Bot. Mag. Tokyo, 19 (1905) 199-222; Just Bot. Jahresb., 33¹ (1907) 119.

GARDENING ON THE ISLAND OF GUIMARAS.

By F. G. LAWTON, *Captain, Nineteenth Infantry.*

LAND.

The land selected was a piece of about one-fourth of an acre, slightly sloping so as to afford good drainage. It was new land, the soil being sandy and inclined to run together after being wet. It was plowed deeply several times and well-rotted manure most liberally applied. Great care was taken in the original preparation as well as in the after care of the ground and I am sure that any failures that occurred could in no way be attributed to any shortcomings in this respect.

PLANTING.

Planting was done in the open ground and in germinating beds toward the latter part of the rainy season, and continued from time to time while there was any chance of obtaining proper climatic conditions. The following sets forth in detail the results obtained:

Beans.—Bush were first tried. Seed sprouted nicely, plants grew well and appeared thrifty up to the point of setting beans. When the beans were about an inch in length they dropped from the vines and the latter died out from rust. D. M. Ferry & Co.'s Golden Wax freshly imported were used.

Pole were tried with better results, however the vines were not very prolific nor did they continue to bear very long. D. M. Ferry & Co.'s Golden Cluster Wax were planted.

Lima beans grew to perfection, but I found that the best imported seed could not compare with the bulk dried beans bought in Iloilo.

Beet and carrot.—Seed sprouted well, plants grew nicely but apparently went to top. My experience convinced me that these vegetables can not be grown profitably on this island.

Cabbage.—Henderson's Early Summer from Ferry gave excellent results. Seed was sown in boxes and transplanted.

Trouble was experienced with worms eating out the buds and no way was found to keep them off.

No doubt cabbage can be profitably grown, and I intend to try it again in my next planting.

Corn.—Excellent results were obtained from the White Mexican June corn sent me by your Bureau. I have ordered Black Mexican and Mammoth from Ferry and will report result of their planting:

Cucumber.—Excellent results were obtained from Ferry's Evergreen White Spine. However, trouble was experienced with bugs on the young plants which was overcome by use of Paris green. The vines were not very prolific and did not continue to bear as long as might be expected. Effort was made to save seed and replant. The result was not encouraging and I do not believe the seed can be used from one crop to another.

Eggplant.—Ferry's Improved Large Purple was planted. It gave beautiful vines and some very handsome fruit. However, the vines would wither and die overnight as if something had bored into the root. Careful examination was made of a number of plants, but I was unable to determine the cause. The young plants, too, were troubled by lice. These were killed with tobacco water. I believe that this vegetable can be grown successfully. I grew excellent ones in profusion from this seed at Malabang, Mindanao.

Lettuce.—Best result obtained with Ferry's Early Prize Head. This grew to perfection, but would not be valuable for market as it is too tender to stand handling. The next best was Ferry's Salamander (black seeded). I find that lettuce seed retains its germinating power for a very short time in this climate.

Muskmelon.—A total failure.

Watermelon.—Georgia Rattlesnake from Ferry grew to perfection. My melons averaged 30 pounds in weight and some went as high as 40 pounds. Shape, color, and taste perfect. I have been told that seed saved from melons here will not reproduce satisfactorily. This I will try out and report on later.

Okra.—White Velvet grows to perfection practically the whole year around.

Onion.—Absolute failure in attempt to grow from seed.

Parsley.—Grows to perfection if started in boxes. Seed must be soaked in luke-warm water for twenty-four hours before planting.

Peas.—Absolute failure.

Pepper.—Both sweet and small chili grew to perfection. Plants started in boxes and transplanted. Attempt to reproduce from seed raised here was a failure. Pepper seed does not keep for any length of time in this climate.

Radishes.—Grown to perfection almost continuously. However, care was necessary to keep earth pulled up around growing plants, otherwise they shot up and made no roots. Peculiarity noticed was that radishes grew old, large, and strong but never lost their crispness.

The French Breakfast was found to be the best, as giving the best root and the smallest top.

Tomato.—Grown to perfection from Ferry's Early Detroit. An effort was made to trim and train vines on poles. They were given ample room and watched carefully, but gave poor success. Another set was raised slightly from the ground on bamboo frames and allowed to grow at will. These vines produced perfect fruit. Vines not as prolific as in the United States and all fruit ripened in about two weeks. Bugs and worms gave considerable trouble. These were picked off by hand and killed with Paris green.

Turnip.—Seed sprouted well and plants started off nicely but they went all to top. They can not be profitably raised here.

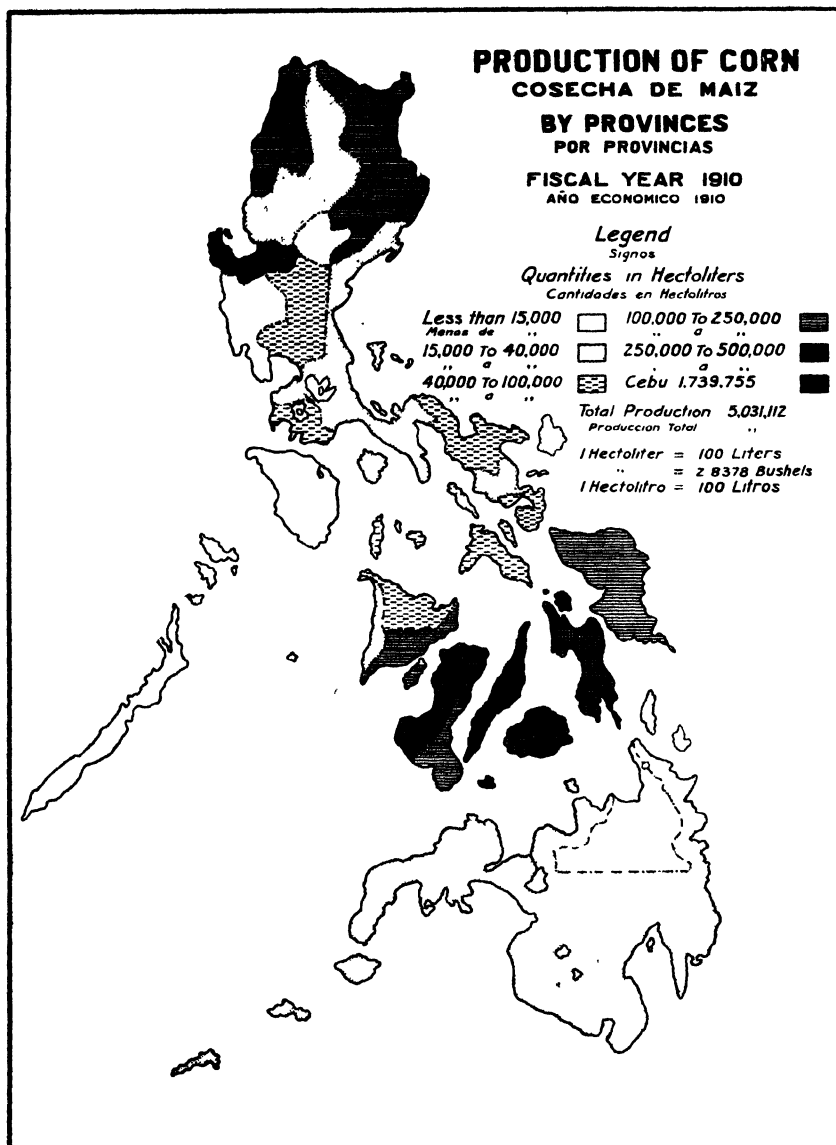
STATISTICS REGARDING CORN AND COCONUTS GROWING IN THE PHILIPPINE ISLANDS.

By W. D. HOBART, *Statistician.*

STATISTICS ON CORN IN THE PHILIPPINE ISLANDS, FISCAL YEAR 1910.

Province.	Amount of corn produced		Area cultivated in hectares.	Liters produced per hectare.
	Cavans.	Hectoliters.		
Agusan.....	16,156	12,117	1,044	1,160
Albay.....	26,882	20,124	3,480	570
Ambos Camarines.....	59,608	44,706	6,992	689
Antique.....	33,793	25,345	4,014	631
Bataan.....	18,406	13,805	2,567	538
Batangas.....	124,523	98,392	13,056	715
Bohol.....	850,814	263,110	84,005	774
Bulacan.....	65,457	49,093	5,181	948
Cagayan.....	804,788	228,591	21,997	1,039
Capiz.....	58,403	43,802	5,356	814
Cavite.....	22,408	16,806	2,119	733
Cebu.....	2,319,673	1,739,755	179,414	968
Ilocos Norte.....	202,963	152,222	14,457	1,053
Ilocos Sur.....	267,824	200,882	27,031	743
Iloilo.....	144,354	108,286	14,144	765
Isabela.....	164,519	123,389	14,728	837
La Laguna.....	45,424	34,068	5,692	598
La Union.....	28,905	21,679	5,228	414
Leyte.....	362,850	272,158	24,118	1,128
Mindoro.....	7,004	5,253	462	1,137
Misamis.....	41,088	30,816	3,484	884
Moro.....	40,467	30,350	3,044	997
Mountain.....	21,773	16,330	4,412	370
Nueva Ecija.....	55,305	41,479	6,092	380
Nueva Vizcaya.....	2,622	1,967	161	1,221
Occidental Negros.....	618,398	463,795	42,771	1,084
Oriental Negros.....	308,585	227,501	26,212	867
Palawan.....	4,987	3,740	433	863
Pampanga.....	57,577	43,182	6,783	641
Pangasinan.....	486,143	363,857	52,161	697
Rizal.....	23,595	17,696	2,492	710
Samar.....	211,672	158,754	18,129	875
Sorsogon.....	119,327	89,495	16,861	530
Surigao.....	45,606	34,205	2,808	1,218
Tarlac.....	17,803	13,352	3,000	445
Tayabas.....	27,007	20,255	5,212	398
Zambales.....	7,727	5,796	678	854
Total.....	6,709,131	5,081,133	579,768	868

The production of corn in the Philippines is increasing, in some provinces, notably Cebu, it being the principal food of the people. Where not grown as an alternate crop two and sometimes three crops a year are harvested. The low production in some provinces is explained because it is planted in the same fields with other crops, and in others because a large proportion is cut for forage, the reports of which so far not having been sufficiently complete to base statistics on.



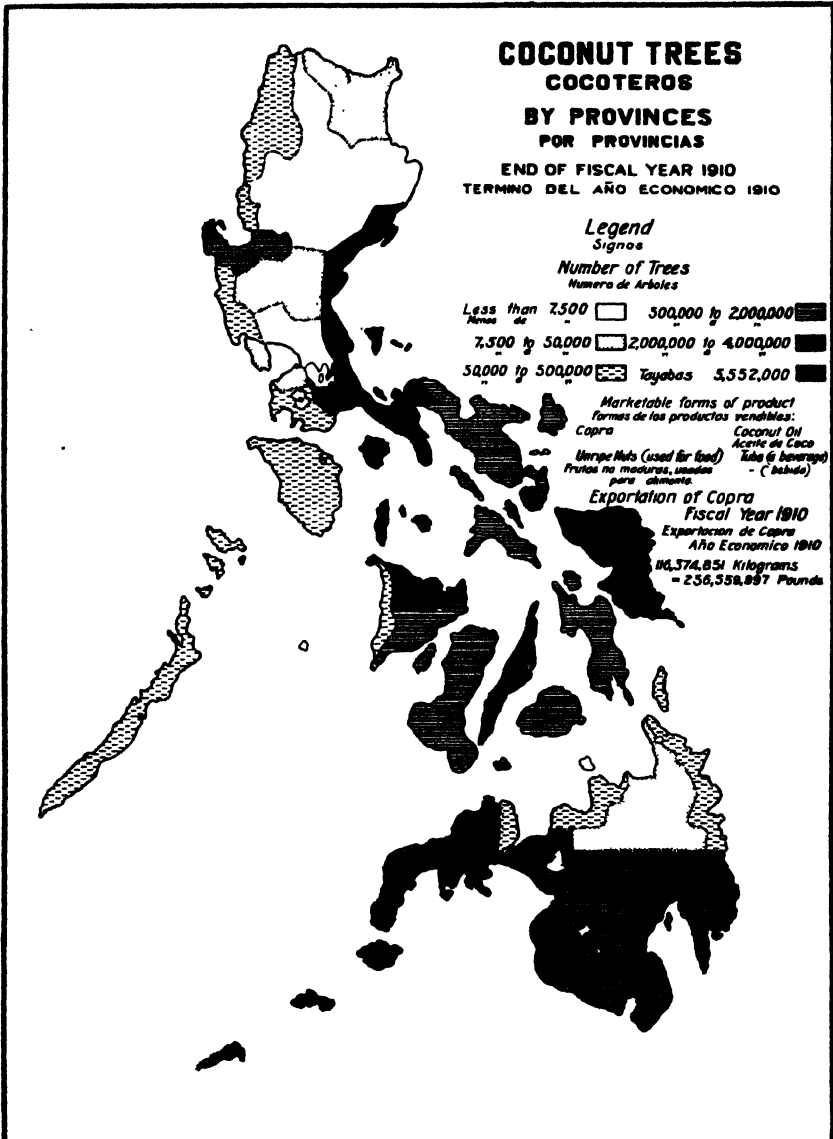
THE PHILIPPINE ISLANDS.

**ENTIRE NUMBER OF COCONUT TREES JUNE 30, 1910, AND THEIR
PRODUCT FOR THE FISCAL YEAR 1910.**

Province.	Trees.	Nuts gathered.	Nuts consumed for food.	Copra.	Oil.	Tuba.
	Number.	Number.	Number.	Kilos.	Liters.	Liters.
Agusan	32,880	631,296	220,954	82,068		51,840
Albay	1,819,047	41,219,640	20,197,624	927,442	1,573,841	40,000
Amboe Camarines	1,491,562	28,876,828	10,895,586	4,259,802	120,319	634,500
Antique	168,086	3,776,892	2,308,304	260,186	18,884	945,270
Bataan	12,483	174,748	174,748			
Batangas	118,574	1,973,056	1,841,678	141,417		
Bohol	1,680,171	49,195,344	9,839,069	7,084,129	842,228	15,594,120
Bulacan	1,995	53,616	53,616			
Cagayan	48,459	992,392	994,392			
Capiz	2,230,390	49,068,580	25,024,976	5,888,229	49,068	13,047,750
Cavite	46,280	777,510	645,338	83,294		
Cebu	2,367,307	88,068,800	21,135,312	13,870,048	954,025	42,611,400
Ilocos Norte	52,614	757,620	583,367		21,782	
Ilocos Sur	82,072	327,280	810,734		1,838	
Iloilo	774,422	13,010,280	8,196,476	1,078,348	43,368	32,200,200
Isabela	527	18,460	18,460			
La Laguna	3,587,920	140,384,640	49,134,622	14,974,362	2,169,580	1,134,000
La Union	122,136	1,954,160	1,367,912	68,370	15,194	
Leyte	1,441,864	60,212,232	17,461,547	10,238,079	138,951	29,197,800
Mindoro	125,304	1,714,140	1,217,089	58,281	17,141	302,770
Misamis	867,694	11,295,424	2,372,089	1,807,270	71,880	595,350
Moro	2,953,012	87,527,232	27,133,441	14,223,175	350,108	237,000
Mountain	7,009	112,128	112,128			
Nueva Ecija	7,564	91,044	91,044			
Nueva Vizcaya	2,718	46,080	41,472		807	
Occidental Negros	616,693	12,432,528	4,848,686	1,367,578	67,814	2,940,010
Oriental Negros	581,659	14,215,708	3,543,927	2,135,925	12,923	27,144
Palawan	129,393	2,442,944	1,270,331	293,153		139,860
Pampanga	2,586					
Pangasinan	1,001,517	37,016,056	25,170,918	2,313,503	235,556	
Rizal	431					
Samar	3,499,029	75,439,055	35,456,356	3,269,026	62,866	23,618,250
Sorsogon	1,481,255	38,453,360	13,458,676	6,056,404	69,915	7,498,440
Surigao	408,869	11,268,400	3,042,468	1,727,821	30,049	1,177,470
Tarlac	14,973	215,610	209,142		647	
Tayabas	5,551,902	162,559,680	22,758,355	82,918,330	623,229	2,490,310
Zambales	58,147	1,130,364	983,416	70,082		
Total	32,838,544	937,927,927	311,609,148	125,140,822	6,993,513	174,483,484

* Trees not in bearing.

A great many coconut trees have been planted the last few years because of the advancing price of and seemingly assured market for copra and the lower prices prevailing for hemp. So far correspondents have reported the total number of trees only, without separating those in bearing and those which have not yet come into bearing. It is roughly estimated that about 22,000,000 coconut trees are now in bearing. Correspondents have in large part failed to fully understand the data desired as to coconut productions, so the above figures are an estimate based on insufficient information. Formerly trees were planted much nearer together than at present, it having been demonstrated that trees planted at intervals of 7½ meters or even more give much better results than those planted closer together. It is because of the wide differences in the density of growth and irregularity of the surfaces they occupy that coconut trees are reported by number instead of the hectares they cover.



THE PHILIPPINE ISLANDS.

INDIAN CATTLE IN THE UNITED STATES.¹

A. P. BORDEN, *Pierce, Texas.*

The zebu or humped cattle of India form a distinct species and are scientifically classed as *Bos indicus*. Darwin in his work on animals and plants under domestication says that the zebu was domesticated as may be seen on the Egyptian monuments at least as early as the Twelfth Dynasty; that is, B. C. 2100. Some time in the early fifties a few animals of this breed, familiarly known as Brahma cattle, were brought into this country, and their offspring then distributed all along the Gulf coast. Observing stockmen soon learned that they stood the climatic conditions and insect pests better than any other breed. From time to time there has been a bull or two obtained from shows and added to the breeding herds of the Gulf coast country.

In 1904 Hon. James Wilson, Secretary of Agriculture, made a visit to Texas and after seeing the condition of the Brahma grade cattle as they then existed on the ranch of A. H. Pierce and comparing them with the beef breeds found on the same ranch had a special permit issued to A. P. Borden, executor of the estate of A. H. Pierce, for the importation of some pure bred animals direct from India. The story of the permit for importation, my trip to India, the purchase of the fifty-one head of animals, their arrival in New York, their quarantine on Simonson's Island, and their final release would make an interesting tale. The points of practical interest are that the cattle were bought with difficulty in India and could not there be tested. When put in quarantine on an island outside the harbor of New York, it was necessary to be at the expense of a long quarantine period to be sure that all brought to the mainland were free of the dread disease *surra*, which is even a more serious disease in horses than in cattle.

¹ From the American Breeders' Magazine, Vol. I, No. 2, 1910.

This importation landed in New York in June, 1906, and in south Texas in November of the same year. It consisted mostly of young bulls. Upon arrival in Texas the cattle were first tested for Texas fever by Doctor Francis of our State Agricultural and Mechanical College. After carefully watching them for ten days he pronounced them to be free from Texas fever. This opinion proved correct, for in the three years since they were imported there have been no signs of this fever. The herd was divided as equally as possible between Mr. O'Connor and the Pierce estate, who jointly had shared the expenses of the importation. I have not seen Mr. O'Connor's cattle, but he tells me they have more than met all his expectations. The object of the importation was to find a race of animals which would resist the insect pests of this section of the country, the principal one of which is the tick which causes Texas fever. These bulls were bred to the best cows on the Pierce range and to a bunch of Hereford cows in 1907 and again in 1908. The crop of calves in 1908 were fine and did remarkably well. We are in the business of raising cattle on the open range where they must care for themselves most of the year. Crosses of these native and grade cattle with the best European beef breed grades do well in the feed lot, yet for the range we find them delicate and susceptible to the ravages of the tick. To make a fair test of the Brahma cattle I turned the bulls on the range with the best cows I could procure in this section of the country, mostly high-grade Herefords. These cows were covered with ticks all the year and as we had no dipping vats we had no way to remove them. We would occasionally find small ticks on the bulls, but were never able to find a fully developed tick on them. The first crop of calves at this writing, November 17, 1909, is from fourteen to twenty months old. They have been in tick-infested pastures with ticky cattle all their lives, but they fail to carry any ticks to maturity as far as I can see. It is only occasionally that we ever see a tick on one of these animals. This first crop of calves, about 300 in number, has grown upon the range as all our cattle and they are fully 50 per cent heavier than our ordinary range calves. They are as heavy as the calves a year older out of the same mothers, but sired by pure-bred Hereford bulls. The cross-bred animals are smooth, with very strong constitution, are good rustlers, of rapid growth, and are animals that have courage enough to look you in the face when you go about them. The results are better than I expected. It may be claimed for these cattle that they have the power of

immunity from Texas fever. They stand a tropical and sub-tropical climate better than the other breeds of cattle. They have the power of transmitting the tick-resistant quality through several generations. An animal with only an eighth or a sixteenth of the Brahma blood in his veins shows ability to thrive in this climate. Several Indian breeds are represented in this importation. Some of these are shown in the illustrations herewith. I wish to state that I am under many obligations to Secretary Wilson and other officers of the Department of Agriculture and also the chairman of the committee on the introduction of plants and animals of the American Breeders Association, Mr. David C. Fairchild, whose letters of introduction and assistance were of service to me.

ANIMAL DISEASES IN FORMOSA.

By FRANCIS W. O'CONNOR,
American Vice-Consul, Tamsui, Formosa.

Rinderpest has been prevalent since the Japanese occupation of the island; but the various urgent calls on the administrative body, till lately, left no time for the serious consideration of animal diseases.

At times when rinderpest was unusually prevalent the Formosan government promulgated regulations for the prevention of animal diseases, inaugurated organizations, and nominated authorities for this purpose. Owing to the efforts of the veterinary surgeons and the police supervision, this hitherto widespread disease has diminished considerably.

At present the disease is found only in limited sections of the island, in Kagi and Tainan, and little fear is entertained as to its spread in the future.

The statistics for the last five years are as follows:

Year.	Deaths.	Killed.	Re-covered.	Totals.
1906	2,530	1,878	717	5,125
1907	534	1,273	57	1,864
1908	908	4,729	1	5,638
1909	376	915		1,291
1910 (January to August)	206	397		603

MILZBRAND (ANTHRAX).

This disease first appeared in Formosa in June, 1907, and only the following cases have been discovered between that date and the present time:

1907	15
1908	7
1909	3
1910 (January to August)	5

SCHWEINESEUCHE-SCHWEINEPEST (SWINE PLAGUE).

This disease, like rinderpest, has long been prevalent in many parts of the island. The following figures show a gradual decrease during the last five years:

Year.	Deaths	Killed.	Re-covered	Totals.
1906.....	1,774	1,751	245	3,770
1907.....	1,716	947	97	2,760
1908.....	557	1,324	41	1,922
1909.....	483	560	70	1,063
1910 (January to August).....	769	723	-----	1,492

BOVINE TUBERCULOSIS.

Until comparatively recently this disease has not been found among oxen or water buffaloes on the island. In 1908 a few cases were found among cattle imported from Japan and Australia, and subsequently it was discovered that water buffaloes and native oxen were affected by the disease.

In 1910 the disease became so prevalent among the native cattle that orders were given for the destruction of those affected, regardless of the condition and severity of the disease; the Government of course making compensation for the loss to the owners. The numbers of animals killed were as follows:

1908	4
1909	13
1910 (January to August).....	161

RAUSCHBRAND (BLACKLEG).

The first case of this disease was discovered in the island in 1909, and since then the following number of cases have been reported:

1909	3
1910 (January to August).....	1

WUTHKRANKHEIT (HYDROPHOBIA).

Only two cases of this disease appeared in 1909. No other diseases have been found among animals in the island which are prejudicial to agriculture and public sanitation.

REGULATIONS RELATIVE TO LAWS OF THE NETHERLANDS INDIA GOVERNING IMPORTATION OF CATTLE.¹

The importation of cattle from Asia and Africa into Java and Madura is forbidden since the year 1897. This also applies to the districts of Bali and Lombok.

In other districts of the colony the importation of cattle may be forbidden by the official chief of the district whenever considered advisable. When such importation is permitted from countries not mentioned in the prohibited list, and if considered necessary, such cattle are put in quarantine for a period of from twelve to twenty-eight days.

Cattle from Europe and America can be landed only in places indicated by the official chiefs of the different districts and only where there is a regular established Government veterinary surgeon, who must examine such cattle before they are allowed to be landed.

If any cattle plague, or other sickness, is discovered among the cattle examined, none of the cattle will be allowed landed and the ship having such cattle on board must leave the port at once, and will not be allowed to enter again until such animals are destroyed (thrown overboard) and the ship is thoroughly disinfected.

Should only part of the cattle be suspected of having cattle sickness and the other part be sound, then the sound cattle are allowed to be landed and put in quarantine for at least twelve days when, should no sickness appear among such cattle, they are set free.

It is required that the cattle suspected of cattle plague, or other sickness, be killed and thrown overboard. Cost of stabling, and other costs, during time of quarantine is for account of the importers of such cattle. There is no charge for Government inspection.

When the entire cargo of cattle are found sound such may be landed without quarantine by special permission of the director of agriculture of the colony.

Cattle from Australian ports may only be landed at Tand-

¹ Furnished by the American consul, Batavia, Java.

joeng Priok (Batavia Harbor), Samarang, and Soerabaya. (For the past three months it is prohibited to import cattle from Victoria and New South Wales.)

Before the cattle are landed the usual examination takes place, declaration from port of shipment declaring cattle sound must be produced, also declaration stating district from which cattle have come is free of any cattle sickness. Should animals be found free from any sickness and the necessary declarations be found in order, they will be landed. Whether such cattle have to be quarantined depends entirely on the director of agriculture.

Horses may be imported into any port of the Netherlands India under the following rules: (a) If there is a qualified government veterinary surgeon at the place where animals are to be landed; (b) if the animals are found sound and have come from a place where there has been no disease among cattle and no sickness has attacked the animals during the voyage; and no quarantine is required if permission can be had from the director of agriculture.

At any time a place in the Netherlands India is found to have contagious cattle diseases, the following preventative measures are enforced by the chief government official of the district:

(a) Isolation of the sick or suspected cattle; (b) removal to a safe distance of all the sound cattle where no other cattle are allowed to be taken; (c) prohibiting the transfer of the sick or suspected cattle to another district or place; (d) killing of all sick or suspected cattle if found necessary; (e) disinfection, or destruction if found necessary, of stables or any article which has come in contact with the sick cattle; (f) disinfection of person, or persons, who have come in contact with the sick cattle; (g) to indicate the districts where sickness has broken out through importation of cattle and to prohibit further importation or exportation of other cattle, meats, bones, horns, milk, hair, wool, dogs, cats, or any kind of poultry, and to prohibit holding any markets, or public sales of such articles; (h) to prohibit any kind of animals or poultry from running loose in such districts; (i) to prohibit walking on the premises where animals which have died from contagious diseases are buried; (j) the appearance of any contagious disease among cattle is to be reported at once by telegraph by the chief government official of the infected district to the director of agriculture, who gives the necessary instructions and publishes notice of such cattle sickness in the Official Gazette of the colony. Further, if required, the chief government official of the infected district has the right to draft in workmen from the native population of the district.

**NUMBER OF HORSES, CATTLE, CARABAOS, HOGS,
GOATS, AND SHEEP IN THE PHILIPPINE
ISLANDS, BY PROVINCES, AT THE
BEGINNING OF FISCAL
YEAR 1911.**

	Horses.	Cattle.	Carabaos.	Hogs.	Goats.	Sheep.
Agusan	202	327	801	4,885	373	30
Albay	4,241	1,133	8,191	50,208	12,082	247
Ambos Camarines	495	1,218	12,305	34,527	21,681	1,153
Antique	270	5,532	13,842	28,254	6,326	586
Bataan	194	266	5,895	7,417	1,725	635
Batanes	19	5,358	1	2,560	991	229
Batangas	20,088	33,797	12,689	87,110	10,743	255
Bohol	2,351	8,023	25,384	520,453	4,675	276
Bulacau	2,651	1,342	30,765	59,278	6,674	717
Cagayan	7,008	10,794	29,206	26,162	5,660	2,090
Capiz	1,886	8,908	28,793	43,699	39,987	1,816
Cavite	4,605	3,245	8,672	34,052	1,761	189
Cebu	90,908	11,428	29,839	263,440	49,235	6,198
Ilocos Norte	11,916	6,938	35,532	37,708	12,054	5,996
Ilocos Sur	9,770	13,300	40,889	70,704	25,154	6,040
Iloilo	1,383	8,002	36,666	86,717	24,447	7,808
Isabela	3,784	2,246	21,756	14,822	2,389	1,119
La Laguna	6,409	1,715	12,873	24,303	3,681	204
La Union	1,826	3,703	18,054	18,789	13,988	3,078
Leyte	3,035	7,070	20,645	59,736	13,455	2,162
Mindoro	2,755	13,581	5,211	6,880	1,815	1,173
Misamis	2,787	1,239	5,858	23,077	5,045	507
Moro	3,897	15,435	10,263	17,738	4,915	1,787
Mountain	3,024	14,623	11,393	24,748	4,525	1,034
Nueva Ecija	718	2,998	28,315	57,333	5,428	94
Nueva Vizcaya	489	680	4,230	5,366	730	22,032
Occidental Negros	1,316	10,769	31,884	45,615	25,065	3,580
Oriental Negros	4,660	3,821	11,871	37,136	20,060	24
Palawan	197	8,738	4,810	3,028	498	4,585
Pampanga	2,623	1,389	30,619	49,471	19,010	2,118
Pangasinan	3,779	12,168	63,129	100,310	2,500	185
Rizal	1,669	799	12,923	19,369	3,693	813
Samar	1,102	1,249	6,511	25,211	2,508	182
Sorsogon	3,166	5,981	10,544	36,210	7,357	7,830
Surigao	1,942	524	8,171	24,763	5,866	91
Tarlac	1,012	1,320	28,428	58,961	2,363	1,619
Tayabas	6,214	8,858	18,165	35,815		
Zambales	1,133	3,886	12,040	20,900		
Total	215,674	242,398	713,121	2,066,605	407,087	88,760

MONTHLY VETERINARY REPORTS—MAY AND JUNE.

In the Island of Luzon there have been no great changes in the rinderpest situation during the past month. Infection exists in the Provinces of Cagayan, Isabela, Mountain, Nueva Vizcaya, La Union, Tarlac, Pampanga, Bulacán, Bataan, Zambales, Cavite, Rizal, La Laguna, Batangas, and Pangasinan.

In all of the provinces above mentioned except Batangas and Pangasinan the situation is practically the same as at the time of the last issue of this publication. In Batangas, where the force has consisted of only one veterinarian and three inspectors, the number of infected municipalities has increased from one to three.

In Pangasinan, which is the only district of Luzon where an adequate force has been maintained, the results of the past month's work have been extremely gratifying. Ten municipalities in the eastern and central part of this province have been freed from the infection and except in the western mountainous district the infection has been so successfully curbed that only fifteen cases have occurred during the last two weeks. In the month of April all of the veterinarians who could be withdrawn from other provinces of Luzon were sent to Pangasinan which at that time harbored the most alarming outbreak that has occurred in these Islands for some time. At that time the infected area was so extensive that all of the force which it was possible to send to the work were unable to attempt eradication of the disease from all infected municipalities simultaneously. On account of this the campaign was started in the eastern part of the province with the view of gradually moving westward as the territory could be cleaned.

The animals in the infected localities were closely confined by being tied in order to prevent their becoming exposed by contact with cases of rinderpest which had not been discovered and isolated, and to prevent infection from streams and pastures. The tying of all animals susceptible to rinderpest is doubly necessary because the exposed individuals may transmit the dis-

ease to other susceptible animals for at least forty-eight hours before the appearance of any symptoms of the disease.

The tying of animals, together with other measures, has succeeded in accomplishing results fulfilling the highest expectations. In the eastern section of the province rinderpest has been practically eradicated and the forces have already moved westward to take up the campaign in the remaining infected localities. The results in Pangasinan have demonstrated that rinderpest can be quickly eradicated from a district whenever a sufficient force is available.

At present the situation in the Visayan Islands is much more encouraging than it has been at any time since this Bureau took up the work of controlling and eradicating animal diseases. In all of the southern islands, including Mindanao, only five municipalities are known to be infected. One of these is in the Province of Iloilo, one in the Island of Siquijor, one in the Province of Surigao, and two in the Island of Cebu. Of course, it is possible that disease exists undiscovered in a few localities and that the infection is still being propagated in the deer and wild hogs of the mountains, but there has been a marked improvement which may mean the complete eradication of rinderpest in one-half of the Philippine Islands within a few months.

MONTHLY CROP REPORTS—MAY AND JUNE.

ABACÁ.

Albay.—There is very little movement in abacá, although the finer grades are seen more frequently than formerly. The hemp growers claim that a relative higher price is paid for the lower grades of fiber than for the better grades, hence some of the hemp growers are again producing low grades of hemp.

Ambos Camarines.—The grade of abacá produced in the Lagonoy section is so low that it is hardly worth the labor and cost of harvesting.

Leyte.—The price of abacá is still very low with no signs of a strengthening market.

Samar.—In the vicinity of Borongan a great deal of abacá is now being placed on the market and prices are very good.

Sorsogon.—The price of the best grade of abacá has dropped about 50 centavos a picul and many complaints are heard about the poor price being paid.

COCONUTS.

Ambos Camarines.—More attention is now being given in the Lagonoy district to coconuts than to any other crop.

Cotabato.—During the month of April some 2,000 coconut trees were planted at Kusiong and about 5,000 were planted in the vicinity of Tamuntaka.

Misamis.—Considerable areas have recently been planted to coconuts in the Island of Camigin.

Samar.—The coconut trees appear to be reviving rapidly from the effects of the late baguio and the fruit, though young, is plentiful. Copra is selling at 14 centavos per kilo and coconuts at ₱3 per hundred.

CORN.

Antique.—There is some fear that early and rather heavy rains will damage the corn crop in the southern part of the province, but at the present time corn seems to be in excellent condition and appearances indicate that the crop will be unusually large.

Cebu.—During the month of April 1,692 hectares were planted to corn and about 456,120 liters were harvested. The price of corn has been from 4 to 6 centavos per liter. The condition of this crop has been only fair.

Leyte.—A large amount of corn has been planted in different parts of the province; the municipality of Burauen alone having approximately 400 hectares of fine corn.

Oriental Negros.—A few good rains during the latter part of April stimulated the farmers of this province in the work of preparing land for the corn crop and it appeared that considerable planting would be done early in May.

MAGUEY.

Cebu.—During the month of April 1,010 hectares of maguey have been planted and about 6,500 kilos have been harvested. The price has ranged from 10 to 12 centavos per kilo. Condition of crop fair.

RICE.

Albay.—During the latter part of April the people in the hills were preparing their land for the mountain rice crop. The farmers of Libon will try this year to raise two crops of rice, planting in May and September. The rice mill recently established at Ligao is running every day and all palay that is offered to this milling company is being purchased.

Ambos Camarines.—The harvest season at Daet and the other towns of northern Camarines is now nearly over and it is estimated by some of the most conservative and intelligent residents of that section that the present crop will amount to nearly 60,000 cavans of palay, which, if these estimates are correct, will give that section of the province approximately 30,000 sacks of rice. This crop will add very materially to the resources of that section and will greatly ameliorate the present rather depressed economic condition of that part of the province.

Reports from the Lagonoy district indicate that the rice crop was so light in many parts of the country around San Jose that the farmers are discouraged and claim that the cost of production exceeded the value of the crop harvested.

The rice crop in the central part of the province has been harvested, and as it is not quite time to begin breaking land for the new crop very little agricultural work is being done.

Bohol.—The conditions of agriculture on the Island of Bohol appear to be very promising. The farmers are taking advantage of the recent rains and are preparing new land for rice and

corn. It has been reported, however, that in a few sections the local food supply is nearly exhausted.

Bulacan.—The recent rains have softened the ground and many farmers have commenced their annual spring plowing preparatory to putting in the rice crop.

Cotabato.—Throughout the valley the Moros are clearing large areas and preparing their fields for the planting of rice. During the month of April 850 cavans of palay and about 700 cavans of rice were shipped out by the Chinese merchants of Cotabato.

Iloilo.—The rainy season started about two months ahead of time this year and if it keeps up a good rice crop should be harvested.

Pampanga.—In the vicinity of Arayat land is being prepared for rice planting and a good crop is anticipated because of the timely rainfall.

Samar.—In the vicinity of Basey the people are busily engaged in clearing new land and planting rice. The inhabitants of this locality are anticipating much better times this year than last. In the vicinity of Borongan and the east coast the demand for rice is still very great and prices are high. Rice now sells at ₱7.50 per sack. In some parts of the province a fine rice crop is reported, but in other sections only about one-third of an average crop.

Sorsogon.—The harvesting of rice was started during the month of April, but owing to frequent rains not much progress was made. The rice crop, on account of the heavy rains, should be much larger than last year.

Tarlac.—The first crop of rice is about ready to harvest and appears in good condition, having had an abundance of rain during the past six weeks.

Zambales.—The farmers were principally engaged throughout the month of May either in plowing their rice lands or in preparing and planting their rice seed beds. During the first two weeks of the month there was sufficient rainfall for agricultural purposes, but the latter half of the month was very dry and rain was very badly needed the first of June.

SUGAR CANE.

Antique.—Cane grinding was completed during the month of April. A conservative approximate estimate of the crop places it at 77,000 piculs.

Cebu.—The condition of the sugar cane crop has been excellent.

La Laguna.—The unprecedented rains during the middle of April caused great loss to the planters. It appears that much cane will be left in the fields, as the rains and limited milling facilities will prevent its harvest.

La Union.—The sugar crop has been bountiful but the price was low.

Occidental Negros.—The milling of sugar cane continues in all parts of the province. Owing to numerous showers from time to time, milling has been somewhat delayed. The labor question is becoming more acute, and it is feared that more or less cane will be left in the fields, owing to lack of hands to harvest at the proper time.

Pampanga.—The planters of Pampanga have harvested and milled all of their sugar crop and are busy drying and packing their sugar preparatory to storage or shipment. Partly owing to difficulties of transportation, due to the prevalence of rinderpest, and partly to the low price of sugar, the majority of the sugar planters are storing their sugar in anticipation of a rise in price later in the season.

Tarlac.—There has been a large demand this year for "seed" for planting and in some localities the local supply has been insufficient. The increased growing of sugar cane in this province should be encouraged.

TOBACCO.

Iloilo.—Some injury has been done to tobacco by the excessive rains.

Isabela.—From present appearance the tobacco crop will be much smaller than last year but of a superior quality. The frequent showers through the central and north central part of the province during the month of April greatly benefited the tobacco crop and are largely responsible for the superior quality of leaf in the vicinity of Tumauni, Ilagan, and Cauayan. Some few people throughout the province are drying their tobacco under sheds, but the majority of them still cling to the old system of curing tobacco in the sun, which seriously injures its quality.

La Union.—The tobacco crop is nearly all in and it failed to come up to expectations, owing to drought. Some difficulty is being experienced by the large buyers in getting the tobacco in from the barrios, because of quarantines on account of rinderpest.

Leyte.—As a result of the low price of abacá the acreage given over to the cultivation of tobacco is double that of last year.

NOTES FROM OTHER FIELDS.

ESTIMATED COST OF LAYING OUT A RUBBER ESTATE.

Tropical Life (Vol. VII, No. 3) gives some interesting information by Mr. Wicherly on the cost of planting up a rubber estate. He says:

The preliminary work of marking off the various fields—which should average 40 acres each, inclusive of paths—detaching the areas which are to provide wind belts, and selecting the sites for cart roads, bungalows, factory, stores, etc., must be done before the clearing contractors are permitted on the land, and a clearly marked sketch of the estate made for the guidance of all concerned. In Ceylon, India, and the Straits Settlements contracts for this kind of labor may be readily placed with the certainty of getting the work done well and expeditiously.

Planting contracts and contracts for buildings, etc., must be arranged separately, and be protected by fines for unnecessary delay or noncompliance with the agreed terms. On the other hand, it is always good policy to offer a bonus for work well and duly completed inside the period allowed.

Hevea brasiliensis is best cultivated from “stumps” and planted 220 to the acre; two important factors which must be taken into account in arriving at an estimate of the ultimate cost of bringing an estate into bearing. The following figures are taken from an estate account appertaining to a property in Ceylon situated nearly eighteen miles from a station and four miles from a Government cart road. It may safely be accepted in all its particulars as to cost, as a fair example of rubber planting, as a whole, not only in that island but in the Mid-East generally:

Contract for clearing and burning (say 460 acres).....	£750
Contract for roading and draining	150
Contract for supplying and planting 101,000 Pará “stumps”	2,100
Contract for factory, bungalows, coolie lines, machinery, tools, and well sinking	3,750
Contract for weeding and maintenance—	
Charges first year	900
Charges second year	570
Charges third year	510
Charges fourth year, including coast advances 250 coolies	915
Making a total of	9,645

which is not quite £21 per acre.

As against this outlay, the estimate of rubber returns for the fifth year (1910) was more than realized. It amounted to 5,120 pounds, and sold for

5s. 1d. per pound net. The estimates for 1911 fix the output at 30,000 pounds, the greater portion of which has actually been sold forward at 5s. per pound.

AGRICULTURAL AND TRADE CONDITIONS OF SAMOA FOR 1909.

In the *Agricultural News* (Vol. X, No. 230) we find an interesting note with regard to the export trade of Samoa for 1909. It is stated that the total exports for that year were valued at ₦1,468,380.96, and the chief of these were copra, valued at ₦1,253,909.16, and cacao, valued at ₦197,403.48.

Rubber plantations which have been recently started are doing well, and it is thought that if success is obtained in this direction, there will be a great increase in the area occupied by this plant. The Government controls all the lands owned by the natives and there are large tracts owned by Europeans. Considerable progress is being made in coconut planting, the trees being planted between cacao trees that already exist. It is stated that this planting of cacao land in coconuts has been brought about chiefly through the appearance of a cacao canker which, while it can be kept in check by constant attention, causes a large amount of damage if it is neglected.

COCONUT BUTTER.

The *Cuba Review* (Vol. IX, No. 3) states that a new substitute for butter has been placed on the market in western Bohemia. This contains no animal fats, but is manufactured from coconut oil, the yolk of eggs, and a small proportion of cream. The coconuts are imported by the shipload by way of Hamburg, up the Elbe River to Aussig, where the factory is located. The entire coconut is utilized in various ways; the meat is pressed for the oil, the outer fibrous coat is used in the manufacture of mats, and the hard shell is made into buttons. For some time coconut oil has been used in Europe in the manufacture of oleomargarine but in combination with lard or other animal fats.

The "vegetable" butter is prepared in two forms, soft and in firm cakes. It is shipped by parcels post from the factory in packages of 5 kilos (11 pounds). It is claimed that this butter substitute has an agreeable flavor, is not injurious to health, and is excellent for cooking purposes. It retails for about ₦0.62 a kilo.

It is said that owing to the fact that the oil from coconuts is now being extensively converted into comestible fats, its market

price has increased enormously, and the world is being sought for additional supplies of coconuts.

PINEAPPLES AS A CATCH CROP FOR RUBBER.

It is stated in *Tropical Life* for April that if there was a favorable market for pineapples this should make a good catch crop between *Hevea* trees, if widely planted. We quote the following statements with regard to the value of this crop:

A plant suitable as a catch crop must have the following qualities: (1) It can grow without interfering with the rubber or retarding the growth of the latter. (2) It must mature and fruit early. (3) It must not have woody roots, which may become liable to be the sites of disease. (4) It can be easily removed without much cost and without doing harm to the roots of the rubber trees. (5) It must not harbor diseases of an infective character.

Away from a remunerative market, the fruit is, unfortunately, a dead loss. At the same time, as the fruit is said to flourish in all localities suitable for the planting of *Hevea*, and since the plants fulfill the above requirements of a satisfactory catch crop, it would be worth trying to develop a trade in the fruit. Failing this, possibly, if the fruit was cut out soon after forming, or even not allowed to form, the fiber contents of the leaves could be strengthened and developed sufficiently to make it pay to extract and export the fiber instead of the fruit. Then *Hevea* would have in pineapples what Cear  enjoys with sisal (*A. sisalana*) as a subsidiary or catch crop.

Should a planter decide [continued our Eastern contemporary] to raise pineapples, he must determine the system of spacing his rubber trees. On the whole one must recommend wide planting, allowing for avenues 30 feet wide and trees 15 feet apart to form the sides. Thus planted, 30 by 15, the *Hevea* trees will develop to the best advantage both their root and leaf systems.

The pineapples should be planted 3 feet away from each rubber plant, and the lines should be so arranged on hill slopes that they serve as terraces to prevent too much wash from rain water. In this way we can get in, say, about 2,000 pineapple plants in an acre. They flower in fifteen to eighteen months and thus a first crop is certain in the second year. In the third year, a large and secondary crop may be expected. After the fourth year the crop begins to deteriorate unless the plants are properly looked after. The main cause of the deterioration is that the pineapple is purely a surface feeder, and as usually the soil on which it grows has been allowed to become completely denuded, the fruit goes back if no attempt is made to restore to the ground the decayed leaves, which in the case of pineapples take a long time to become humus.

Soil exhaustion by the plants could be greatly minimized with attention and by a judicious use of manures, but for keeping down weeds, discouraging soil erosion, helping to isolate the belts of rubber trees, and keeping the soil open and aerated, pineapple plants certainly have many points in their favor, apart from any profits to be derived from their fruit or fiber.

RUBBER CONDITIONS IN MEXICO.

The Bulletin of the Department of Agriculture of Trinidad (No. 67) states that in Mexico, India rubber is obtained from two different plants, *Guayule* and *Castilloa elastica*. In the fiscal year 1908-9 the total export amounted to 6,015,173 kilos, the respective proportions of *Guayule* and *Castilloa* being 5,601,858 kilos and 413,315 kilos. The expectations with respect to the *Castilloa* tree have not been fulfilled. In Paleuque there are well-developed 14-year-old trees yielding no latex, while in the Isthmus 7 or 8 year old trees in normal conditions give 90 to 120 grams (3.2 to 3.5 ounces) per year. The most promising *Castilloa* plantation has an area of 500 hectares with 350,000 trees 6 to 8 years old which yield an average of 73.6 kilos per hectare of commercial raw rubber. The total area planted to *Castilloa* is estimated at 36,000 hectares, and taking the yield for a 10-year-old plant as 150 grams (5.3 ounces) and assuming that there are 500 trees per hectare, then the yield of plantation rubber in the year 1915, given favorable weather conditions, may be estimated at 2,700,000 kilos.

THE PRODUCTION OF SUGAR IN JAVA.

The International Sugar Journal (vol. 13, No. 147) gives the following details with regard to the sugar production in Java for the season of 1909-10:

One hundred and eighty-two factories were at work during the period; of these, 161 sent in data to the Manufacturers' Association. They produced 1,150,127 tons of sugar as compared with 1,123,822 tons in 1908-9. Since the total production of sugar in Java in 1909 was 1,241,726 tons, then, assuming the factories unaccounted for do not increase their output, the 1910 total is estimated at 1,278,420, an increase of 2.9 per cent. The plantings in 1910 amounted to 314,335 acres; those for 1911 are expected to cover 325,130, an increase of 3.4 per cent.

A CENTRAL SUGAR FACTORY IN ST. KITTS.

Some interesting comments on sugar conditions in the British West Indies with regard to central sugar factories are published in the International Sugar Journal for March, 1911. The article states that a company has already been formed in London for the erection of a central sugar factory in St. Kitts and preparations are being made to begin construction at once. A similar company was brought out about six years ago in Antigua and has been successfully worked, and the new undertaking in St. Kitts will follow along the same lines.

It is expected that the coöperation between cane grower and

sugar manufacturer will result in substantial benefit to owners of sugar properties in the West Indies, and more especially to the smaller planters who have been financially handicapped. With their limited resources it was difficult to turn out cane of the best quality and also to produce sugar of sufficiently high saccharine value to compete in the open market with countries like Java, Cuba, and Mauritius, which grow cane on a large scale and have all the best modern machinery. Under the new system the planter is released from manufacturing his product and is able to devote the whole of his capital and time to the production and improvement of his crop, while the process of manufacture is transferred to a central mill managed by professional engineers and chemists.

The Antigua company had for its object the mutual coöperation of planter and mill owner, and we quote the following with regard to the general management:

In the first place the planters entered into an agreement with the factory to grow and deliver for a term of fifteen years cane sufficient to supply the factory, the capital for the erection and working of which being obtained partly by a loan of £15,000, free of interest, from the government of the Leeward Islands and partly by the issue of shares and debentures to the amount of £25,000 by a company formed for the purpose of building a central factory.

The results for the six years have been eminently satisfactory and are creditable to the management and encouraging to the new enterprise.

The company at St. Kitts, while run on the same general lines, will not receive any assistance from local authorities, and it is thought with good management the business is capable of doing as well as its predecessor, especially as the factory will be constructed on a larger scale, and the cane which supplies it comes from a very fertile island.

It is understood that a railway will be constructed to facilitate the delivery of a large and regular supply of cane, and it is suggested that considerable expense might be saved by the employment of motors using oil fuel. In view of the severe competition of the present day, it is also advised that as the planters are relieved from the burden of manufacturing their product, their attention should be directed toward the employment of modern agricultural machinery and intensive cultivation.

•

MARKET REPORTS.

NOTES ON MANILA MARKETS FOR MAY.

By KER & Co

[Based on advices from New York, April 7, San Francisco, April 12; London, April 12;
Hongkong, May 12, Iloilo, May 13; Cebu, May 13]

SUGAR.

Iloilo.—We quote No. 1, ₱7.375; No. 2, ₱7; and No. 3, ₱6 per picul; holders are firm. Nearly half this season's crop has now been exported.

Manila.—Quotations unaltered but buyers more reserved.

Cebu.—Nothing reported in the interval.

HEMP.

For better qualities market has continued very dull, but for lower grades is steady on the basis of ₱7.50 United Kingdom and ₱7.75 United States current per picul first cost f. o. b. Good current may now be quoted ₱14 per picul first cost f. o. b. Receipts for the fortnight at all ports 54,338 bales.

COPRA.

Market advanced to ₱11 Cebu fair merchantable sun dried, and ₱10.50 Manila fair merchantable per picul first cost f. o. b.; at the close values are 25 to 50 cents per picul easier.

MANILA AND LONDON FIBER MARKET.

Receipts and shipments of Manila hemp.

[Telegram from Manila to London, June 12, 1911.]

	1911	1910
Hemp receipts at:	<i>Bales.</i>	<i>Bales.</i>
Manila since January 1	470, 850	464, 171
Cebu, etc., since January 1	138, 469	147, 948
All ports since January 1	606, 819	612, 119
Shipments by steamer to:		
United Kingdom, cleared since January 1	257, 167	208, 716
Atlantic coast, United States, cleared since January 1	170, 203	228, 899
Pacific coast, United States, cleared since January 1	60, 539	49, 433
Continental ports, cleared since January 1	52, 135	27, 843
Shipments to:		
All other ports	31, 905	
Local consumption since January 1	5, 000	
	36, 905	32, 505
Loading steamer on the berth for		
United Kingdom, about		3, 000
Atlantic coast, United States, about	10, 000	10, 000
Pacific coast, United States, about	14, 000	3, 000
Loading per sailer for Atlantic coast, United States		20, 000

Bales of hemp loading for United States, by steamer:

Indravelli 10,000

Bales of hemp loading for Pacific coast, by steamer:

Imerio 12,000*Manchuria* 2,000

FIBER QUOTATIONS.

The following prices for Manila hemp, sisal, and maguey were quoted by Messrs. Landauer & Co., London, and Messrs. Sloan & Mitchell, of Manila, on April 26, 1911.¹

Manila hemp.—Fine marks have been dealt in at figures which are again in favor of buyers. The market for spot hemp has ruled quiet, without change in value, viz, £19 to £19 5/- for fair current in store, and £18 15/- for dock parcels, also good brown at £18.

Range of prices.

Grades.	London.			Manila, per picul.
	Spot and close by.			
	Per ton.	Per ton.	Per picul.	
Best marks	43/- to 46/-	£430. 00-460. 00	₱26. 90-28. 75	
Good marks	41/- to 42/-	410. 00-420. 00	25. 62-26. 25	
Good current.	33/- to 34/-	330. 00-340. 00	20. 65-21. 25	₱14. 60
25 per cent over current.	22½ to 23½	223. 00-230. 00	13. 95-14. 35	8. 20
Fair current.	19/- to 19½	190. 00-193. 00	11. 85-12. 10	
Superior seconds.	18½ to 18¾	188. 00-184. 50	11. 45-11. 55	7. 20
Good seconds	18½ to 18½	181. 50-188. 00	11. 35-11. 45	7. 00
Fair seconds	18/- to 18½	180. 00-181. 50	11. 25-11. 35	
Good brown.	17½ to 18/-	174. 50-180. 00	10. 90-11. 25	
Fair brown.	17½ to 18/-	174. 50-180. 00	10. 90-11. 25	

¹ These quotations are in pounds and shillings English currency per ton. One pound equals about 10 pesos Philippine currency. One ton equals approximately 16 piculs.

Sisal hemp.—The market is lifeless. The quotation in New York is nominally 4 cents, equal to £19 10/- charges including freight London for fair average quality, and £20 5/- for selected per ton.

Manila maguey.—Values £16 to £16 10/- No. 1, £14 10/- to £15 No. 2, and £13 10/- to £13 15/- for No. 3.

The Manila quotations for the same date were ₱6.40 per picul for No. 1.

ILOILO SUGAR MARKET FOR APRIL.

Sugar was received from the mills and sugar districts during the month of April, amounting to 364,105 piculs. The market for the sugar crop opened April 1 at 6 pesos and $3\frac{1}{2}$ reales,¹ and on the 17th the price went up to 6 pesos and $5\frac{1}{2}$ reales where it continued until the 19th, on which day it advanced to 6 pesos and $6\frac{1}{2}$ reales. Beginning on the 22d it dropped gradually, standing at 6 pesos and $2\frac{1}{2}$ reales at the close of the month.

April shipments.

[In piculs]

Date.	Vessel.	Destination.	Superior.	Wet.
Apr. 6	Beachy	New York	88,000	
Apr. 7	Seneca	do	56,000	
Apr. 21	Kennebec	do	80,000	
Apr. 22	Epsom	San Francisco	40,400	
Total for April			264,400	

Exports up to May 7, 1911.

Date.	1909-10 crop.		1910-11 crop.	
	Superior.	Wet.	Superior.	Wet
United States	424,800		475,600	
China	64,575	486	135,972	29.38
Total	489,375	486	611,572	29.38

¹ One real equals $12\frac{1}{2}$ centavos.

PRINCIPAL PHILIPPINE IMPORTS AND EXPORTS— APRIL, 1911.

By the INSULAR COLLECTOR OF CUSTOMS.

[Values in dollars, U. S. currency]

IMPORTS.

Articles		Manila.	Cebu.	Iloilo.	Totals.
Rice	(Kilos	9,840,768	7,045,950	3,576,091	20,462,807
	(Value	369,517	205,452	129,611	704,580
Beef cattle	(Number	3,737			3,737
	(Value	86,745			86,745
Eggs	(Dozens	387,706	94	168	387,971
	(Value	27,294	11	20	27,325
Sugar	(Kilos	190,849	21,683	7,964	220,496
	(Value	12,840	1,698	566	15,104
Coffee	(Kilos	19,537		210	19,747
	(Value	5,528		115	5,643
Cacao	(Kilos	68,163	7,602		75,765
	(Value	18,265	1,999		20,264
Raw cotton	(Kilos	151			151
	(Value	56			56

EXPORTS.

Hemp	(Kilos	12,899,561	3,370,720		16,270,281
	(Value	1,237,372	320,139		1,557,511
Copra	(Kilos	7,239,185	3,031,691	302,074	10,572,950
	(Value	471,490	243,856	23,000	738,346
Sugar	(Kilos	11,853,017		19,331,403	31,244,420
	(Value	621,952		1,009,325	1,631,277
Cigars	(Thousand	10,374			10,374
	(Value	140,007			140,007
Cigarettes	(Thousand	2,414			2,414
	(Value	1,799			1,799
Tobacco	(Kilos	1,280,599			1,280,599
	(Value	180,712			180,712

TEMPERATURE AND RAINFALL FOR AGRICULTURAL DISTRICTS IN THE PHILIPPINES—MAY, 1911.

By the DIRECTOR OF THE WEATHER BUREAU.

[Temperature and total rainfall for twenty-four hours beginning at 6 a. m. each day.]

Date.	Hemp.				Sugar, Iloilo.		Rice, Tarlac.		Tobacco.			
	Albay.		Tacloban		Temperature.	Rainfall.	Temperature.	Rainfall.	Aparri.		San Fernando.	
	Temperature.	Rainfall.	Temperature.	Rainfall.					Temperature.	Rainfall.	Temperature.	Rainfall.
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
1	27.5	5.6	27.4	0.5	26	4.3	29.2		26.2		27.9	
2	26.5	7.1	26.8		25.3	23.6	29.8		25.9		28.4	
3	26.1	3.3	27.5	3.6	26.2	2.8	28		25.5		28.3	
4	27	9.7	27.1		26.4	7.1	28.4		26.6		28.4	
5	26.4	6.4	26.9		26.1	1.1	27.6		27.2		28.9	
6	26.8	9.4	26.6		26.6	1.3	28		27.5		29.4	51.3
7	26.2		26.8	10.7	26.3		27.7		26.9	0.8	27.2	5.6
8	26.5		27		27.1		27.6	1	25.4	40.9	27.2	.3
9	27.2		28		26.3		28.2		25.1	28.7	28.2	.3
10	27.2		27.4		26.6	20.1	28.8		25.5	6.4	27.1	
11	28.4		26.9	7.4	27.6	.5	28.9	6.4	26.8		28	
12	29.3		28.2	1.8	28.1		29.3	3.8	27.2		27.4	.3
13	28.9		25.2	25.4	28		28.5		27.3		27.6	.5
14	27	49	25.7	17	26.9	7.6	29	1.5	26.8		28.2	
15	28	11.9	26.7		26.4	1.8	29	1.3	26.9	15.2	28.4	
16	26.6		25.5	26.7	26.8	2	27.9		26.8		29.8	8
17	27.5	10	26.7	.8	27.2		28.4		27.3		28.2	.5
18	27.3		26.4		27.1		28.8	1	27		27.6	.5
19	27.7		27		27.1	14	28.5		26.6		28.3	
20	28		27.4		27.2		28.6		27.7		28.9	
21	28.2	2	28.1		27.6	8.3	29.6		28		29.9	
22	28.7		28.2	3.3	29	.5	29.5	1.3	27.8		28.7	
23	28.3		28.2		28.6		29.8	12.7	27.8		28.6	
24	28.6		28.2		28.5	.3	29		27.1	2.5	29.2	
25	28.4		28.5		27.3		29.5		28		28.9	
26	28.7		28.7		27.2		29.8	1.8	28	42.9	28.8	
27	28.5	1.3	28.7		28.2		29.8	.8	27.8		29.4	
28	29.4		28.6		28.5		29.4	2.3	28		29.4	
29	28.5		28.7		28		29.9	14	27.9		30.2	
30	28.6	.8	28.8		28.1	16.3	29.6		27.8		29.4	.3
31	28.5		27.5	10.9	27.4	13.2	29	6.6	27.6		28.6	1.3

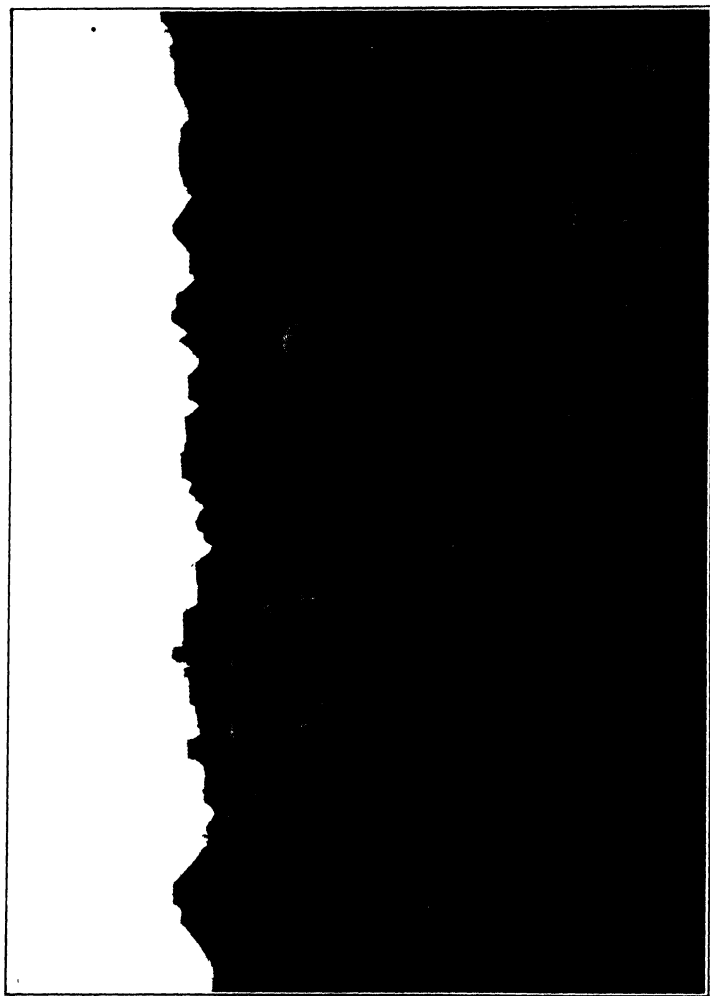


PLATE I.—HARVESTING ZACATE NEAR MANILA.

FORAGE NUMBER

THE PHILIPPINE *Agricultural Review*

VOL. IV

AUGUST, 1911

No. 8

CONTENTS AND ILLUSTRATIONS.

CONTENTS.

	Page.
Editorial	392
Forage Crops and Forage Conditions in the Philippines, by Charles V. Piper, Agrostologist, United States Department of Agriculture	394
Letter of Transmittal	394
Introduction	395
Natural Forage Conditions in the Philippines	397
The Improvement of the Natural Pasture	398
Cultivated Forage Crops	400
Live Stock Other than Horses	409
The Outlook for Animal Husbandry	412
Horses in the Philippines	413
Grasses for Hay	413
The Production of Hay in the Philippines	416
Grains and Other Concentrated Feeds	419
Notes on Native and Naturalized Pasture Plants	421
Summary	428
Extracts from Report of the Proceedings of a Board of Officers of the Civil Government of the Philippine Islands and of the United States Army, appointed by the Secretary of War	429
Order Convening the Board	429
First Meeting of Board	430
Instructions to the Recorder	431
Recorder's Report	431
Various Feeds in the Philippine Islands	432
Forage Imported into the Philippines	433
Daily Feeds in Private Stables	434
Daily Feeds in the Various Government Departments	434
Native Grasses	435
Crushed Feeds	443
Recommendations	445
Tests Being Made	450
Present Division Forage Ration, With Cost	451
Nutritive Ratios	452
G. O. No. 88, Philippines Division, Forage	453
Forage Raising at Trinidad Stock Farm	453
Corn-blade Fodder	454
Report on Feeding Tests	457
Results to Date	461

ILLUSTRATIONS.

PLATE I Harvesting Zacate near Manila	Frontispiece.
	Facing page—
II Beggarweed (on right) and Rhodes Grass (on left), two-thirds grown, at Alabang Stock Farm	406
III Sudan Grass, Alabang Stock Farm	414
IV. Cowpeas, Lamao Experiment Station	428
V Guinea Grass, Singalong Experiment Station	438
VI Forage Beans, three months old, Singalong Experiment Station . .	460

EDITORIAL.

THE FORAGE PROBLEM IN THE PHILIPPINES.

The local production of an abundant supply of satisfactory forage for both native and imported live stock constitutes the forage problem of the Philippines. The importance of this problem is indicated by the fact that approximately two million pesos' worth of forage is imported into the Islands each year. With large areas of uncultivated land, and with soil and climatic conditions favorable for the production of a number of different staple forage crops, it is entirely reasonable to believe that forage produced in the Islands can be used largely, if not entirely, in place of that which is now imported.

The forage used in the Philippines includes four classes of materials, viz, green forage, hay, grain, and crushed or "mixed" fodders. The first step toward the local production of any or all of these materials is the testing of both native and introduced forage plants for the purpose of determining those that can be satisfactorily grown under existing soil and climatic conditions, and that are best suited for feeding our live stock. This work has been carried on for a number of years by the Bureau of Agriculture. A large number of plants have been thoroughly tested under varying conditions of soil and climate and in different localities. Several of the more promising, among which may be mentioned Guinea grass, sorghum, and Mexican June corn, have been widely distributed and are now being grown on a commercial scale.

The production of an adequate supply of green forage in the Philippine Islands is not a difficult problem. A number of plants that are satisfactory for green forage are now available, and others that appear to be promising are being tested. The Army is using from year to year increasing amounts of green forage, and with this increased and more regular demand the growers are offered inducements for increased production which have not heretofore existed. The substitution of locally grown hay and grain for materials now imported is a much more

difficult and complicated question and one that calls for a large amount of investigation and experiment. The progress that has been made along these lines is covered by the reports published in this number of the REVIEW.

On September 1, 1910, a Forage Board, composed of representatives of both the Civil Government of the Philippine Islands and the United States Army, was appointed by the Secretary of War to investigate and report whether native forage can be substituted for that now being used by the Army in the Philippines, and also whether native beef can be used wholly or in part for the supply of the Army in the Philippines. Early in 1911 Prof. C. V. Piper, Agrostologist of the United States Department of Agriculture, was detailed to investigate the forage problem in the Philippines, and has recently completed this work.

The report of the Forage Board and that of Professor Piper constitute such an exhaustive and valuable discussion of this important subject that it seems desirable to publish them herewith as a special "Forage Number" of the REVIEW. The report of the Forage Board is of such length as to render impracticable its publication entire. The extracts selected cover about one-half of the report and include the material which it is believed will be of the greatest interest to the general public. The report of Professor Piper is published entire, with the exception of the appendixes, which cover plans for future work. These reports, together with a report on "Forage Investigations in the Philippine Islands," prepared for the Secretary of War by the Director of Agriculture and published in the REVIEW for February, 1908, cover in considerable detail the work that has thus far been done.

Arrangements have been perfected to continue this work on a more extensive scale during the coming year. Mr. H. T. Nielson, a well-known forage expert in the United States has been appointed to the Philippine service, and is expected to arrive in Manila in October. Mr. Nielson will have immediate charge of experimental field work with forage crops at the "Hacienda Luisita," San Miguel, Tarlac, and will also have general supervision of all forage work of the Bureau of Agriculture.

FORAGE CROPS AND FORAGE CONDITIONS IN THE PHILIPPINES.

By CHARLES V. PIPER,

Agrostologist, United States Department of Agriculture.

LETTER OF TRANSMITTAL.

MANILA, *July 5, 1911.*

SIR: I have the honor to submit herewith a report entitled "Forage Crops and Forage Conditions in the Philippines." It is based on my personal observations during the past five months supplemented by the previous investigations of the Bureau, both published and unpublished, and by other sources of information duly acknowledged in the proper places.

The report is designed to be an epitome of our present knowledge concerning forages in the Philippine Islands and to serve as a basis for further investigations, especially in the production of hay and grains and the improvements of pastures.

While this report is made comprehensive, the particular object of the present investigation has been to determine the feasibility of producing hay in the Philippines for use by the Army horses. Complete success in this direction seems well-nigh certain, judged by results secured in small plot experiments during the present season, especially with Rhodes grass. Arrangements have accordingly been made to grow this grass, as well as several others of promise, on a considerable scale during the coming season.

There is appended to this report, therefore, detailed outlines of the experiments to be conducted next season at the various experimental farms available. This should be supplemented as far as possible by enlisting the assistance of other persons throughout the Islands, who may be interested in the production of better forage, especially hay. To this end it would be advisable to supply all such persons with seeds of Rhodes grass, Natal grass, and Sudan grass.

For the valuable assistance and unfailing courtesies accorded me by yourself and members of your staff, I am under deep obligations.

Very respectfully,

(Signed) C. V. PIPER,
Agrostologist,

United States Department of Agriculture.

DIRECTOR OF AGRICULTURE, MANILA, P. I.

INTRODUCTION.

The growing of forage crops in tropical countries presents some radically different aspects from the culture of similar crops in temperate regions. In the latter the regular recurrence of a winter season during which live stock must be fed on stored feeds has necessitated the use of hay or ensilage or other roughage artificially prepared.

In the Tropics, on the other hand, in regions where the rainfall is comparatively equable, the growth of grasses and other forage plants goes on throughout the year so that there is never any great dearth of pasturage due to climatic reasons. Such a dearth does occur, however, in tropical regions which present desert conditions during all or a part of the year. In the former case the land is sparsely if at all inhabited. In the latter case the common solution of the problem of dry feeds has been by growing irrigated crops during the dry season and not by the storage of forage grown in the wet season.

In general the roughage fed to animals in tropical regions is green grass or the herbage of crops grown for human food, such as maize and various legumes, but to a limited extent crops are grown especially for this purpose, particularly sorghum and various millets.

Such green feeds if used alone are usually too laxative to be desirable for horses, and where the transportation of forage is necessary, are not practicable. While native horses seldom receive other roughage than green grass, such feed is not desirable for imported horses, especially those used for livery and for army purposes, which are for the most part fed on imported hay and grain. This is the present condition of affairs in the Philippines.

During the past year there was imported into the Philippines about 25,000 tons of hay, costing \$650,000, 15,000 tons of oats, costing about \$530,000, and of bran and prepared feeds, 6,000 tons, costing about \$200,000, a total—if we include other minor items—of about \$1,500,000.

It is therefore a matter of considerable importance to determine if satisfactory substitutes for these imported forages can not be produced in the Philippines. It is this phase of the forage question that is of the greatest present interest, as the market is already at hand provided that suitable feeds can be produced.

The larger phases of animal husbandry are, however, of great future interest in view of the enormous areas of grasslands in the Islands. The present capabilities and future possibilities of this pasturage, especially if supplemented with cultivated forage, have therefore received attention and are reported on as fully as present information permits. There can be but little question of the great development of animal industry in the Philippines as soon as the danger of disease is sufficiently minimized, and in view of this approaching event, it is very desirable to secure as soon as possible by experimental methods the data necessary for the highest success.

Detailed information concerning the present feeding of livery horses in the Philippines, both native and imported, has not been considered as it is fully set forth in the report of the Forage Board.

As regards the native Filipino ponies, these are fed almost exclusively on barit or other green grass purchased in the market or cut on near-by lands. This is usually supplemented by a small ration of palay (unhulled rice) but in general the native-owned horses present a half-starved appearance. This is due more to insufficient feeding than to any lack in the quality of the feeds used.

So far as native cattle, carabaos, sheep, and goats are concerned, there is no serious problem. They all do well on the native pasturage or cut grass and except in the case of city work animals rarely receive any other feed. Until the cattle industry is developed to the stage of producing high quality beef, there will be little demand for finishing feeds. When that time arrives there is a great variety of forages of proven merit at hand and it remains only to determine the best both from the standpoint of quality and economy.

So far as carabaos and cattle used in city work are concerned there can be but little question that they would be far more efficient if better fed. Here too the trouble is insufficient feed rather than poor quality. In general, native animals of any kind receive far too little care and a betterment in this respect may be expected only as the result of persistent education.

NATURAL FORAGE CONDITIONS IN THE PHILIPPINES.

Originally all or nearly all of the land in the Philippine Islands seems to have been covered with a heavy growth of forest, except on the higher mountain ranges. This is still true of over one-third of the total area. Wherever the land has been cleared of forest and neglected it very frequently becomes covered with a dense growth of coarse grasses, principally cogon (*Imperata cylindrica Kocinigii* Benthani), and to a much less extent talahib (*Saccharum spontaneum indicum* Hackel). Such cogon clearings are commonly burned over by the natives whenever the grass is dry enough, so that it is only in exceptional cases that the land becomes reforested. Cogon, when young and tender, is readily eaten by cattle and carabaos and is a fairly satisfactory pasture grass. Even when in head, native cattle and carabaos eat it to some extent.

Under heavy pasturing the cogon gradually becomes smaller and gives way largely to finer and better pasture grasses including Bermuda (*Cynodon dactylon*), luyaluya (*Panicum repens*), *Andropogon aciculatus*, carabao grass (*Paspalum conjugatum*), and various sedges, principally species of *Cyperus* and *Fimbristylis*.

The total area of the cogon lands aggregates perhaps 6,000,000 hectares and is capable of supporting great herds of cattle when once the menace of rinderpest is removed. The improvement of these pastures under heavy grazing is a fact of much importance and while the replacement of cogon by finer grasses will reduce the amount of herbage produced, it will probably increase the actual stock carrying capacity of the land, especially in view of the fact that both Bermuda and carabao grass (*Paspalum conjugatum*), as well as other introduced species, show so much aggressiveness.

Actual experiments to determine the rapidity of improving cogon pastures by the use of the finer grasses are important. This should be done not only with Bermuda and other species already in the Islands but with various other species valuable elsewhere but not yet introduced in the Philippines. Such include carpet grass (*Paspalum compressum*), St. Augustine grass (*Stenotaphrum americanum*), Natal grass (*Tricholæne rosea*), and various other species. Such grasses will of course be valuable in pastures only if they are able to maintain and increase themselves in competition with the native grasses.

Apart from the cogon meadows other grass formations of

particular importance are barili (*Panicum stagninum*), which forms a nearly pure growth on marsh lands; luyaluya (*Panicum repens*), the most abundant grass in the low-lying rice paddies; carabao grass (*Paspalum conjugatum*), which practically occupies all cultivated ground when shady as well as great patches in moist areas in the full sunlight. To these formations are to be added the mountain meadows where a considerable variety of grasses occurs depending on soil and altitude. The most abundant of these are *Themeda triandra*, *Ischæmum arundinaceum*, and *Axonopus semialatus*.

From the experience of the Trinidad stock farm the second mentioned seems to be by all odds the most valuable of these grasses, though the first mentioned affords good pasturage. Attempts have been made to introduce various other pasture grasses on these meadows and considerable success has been had with Bermuda except on the very highest peaks. No success has thus far attended the efforts to introduce Japan clover (*Lespedeza striata*).

One other group of grasses should also be mentioned, namely, the crab grasses (*Digitaria sanguinalis*, *Digitaria consaguinea*, and *Digitaria longiflora*), which grow in corn and similarly cultivated crops much as the first-named species does in the southern United States. Were the areas of such cultivated land in the Philippines more extensive a large hay supply could easily be secured from crab grass which owing to its fine stems cures readily and makes hay of fair quality.

At the present time there is an abundance of natural grasses in waste lands about the cities and the poorer owners of horses and carabaos cut such grass instead of purchasing barit. Near Manila these grasses are cut in about this order of preference, luyaluya, cogon, *Eleusine indica*, and carabao grass (*Paspalum conjugatum*). The last-mentioned grass is seldom cut when others are available and even then it is mostly fed to carabaos.

Into the Manila market come also large quantities of barili (*Panicum stagninum*), and in other towns Bermuda and other grasses are thus used.

THE IMPROVEMENT OF NATURAL PASTURES.

The pasturage of the Islands may conveniently be considered under two headings, namely, that which occurs on cultivated lands and that on uncultivated lands.

The greatest amount of pasturage on cultivated land is that which occurs on rice paddies during the dry season, namely, January to June in most parts of the Islands. The most abund-

ant grass on rice lands is luyaluya (*Panicum repens*). Others that often occur and sometimes in pure growth, are *Ischæmum rugosum*, *Panicum colonum*, *Andropogon sericeus*, and Bermuda. This pasturage is of fair quality and carabaos subsist almost wholly upon it during the dry period.

The best of these grasses is Bermuda, which is only locally abundant. It is easily established and undoubtedly all pastures, especially the moister ones, would be greatly improved by encouraging this grass.

In lands cultivated during the dry season various grasses appear, especially crab grasses (*Digitaria*), finger grasses (*Eleusine* and *Dactyloctenium*), *Panicum colonum*, *Panicum distachyum*, and Bermuda. These grasses furnish good pasturage and the crab grass especially is often abundant enough to cut for hay. Various other plants can be utilized in this way to advantage, especially Florida beggarweed, Mexican clover (*Richardsonia scabra*), Natal grass, and others. Such weedy grasses furnish a large amount of hay or pasturage in the southern United States and they can be utilized in the same way in the Philippines.

In uncultivated lands the cogon meadows of the low altitudes need to be considered separately from the mountain pastures.

As before stated the cogon and the other coarse grass can not withstand continuous heavy pasturing and thus the growth of various finer grasses is encouraged. The most valuable of these is Bermuda, which should be introduced when necessary by scattering small pieces of sod or roots, especially during the rainy season. Various other grasses are worthy of careful testing for this purpose, both on heavy and on light soils. Among these are St. Augustine grass (*Stenotaphrum americanum*), carpet grass (*Paspalum compressum*), Rhodes grass, and in wet places Pará grass.

In the mountain meadowlands Bermuda grass has been found of value, but attempts to establish Japan clover have failed. The conditions offer hope that several temperate grasses may be found valuable. Among those that should be fully tested are redtop, orchard grass, tall meadow oat grass, perennial rye grass, Texas blue grass, and Canada blue grass. In addition all the tropical grasses mentioned in the previous paragraph should be tried.

It is always a difficult matter to predict whether a grass introduced into a new environment will succeed in competition with the native grasses, and not unfrequently very unpromising-looking grasses have proven to be highly valuable.

Many plants of American origin, such as guava, cassava, *Paspalum conjugatum*, and *Desmodium procumbens*, have spread abundantly and undoubtedly the same thing will prove to be true of many grasses and legumes of forage value. Many of these should, therefore, be introduced even if not worthy of cultivation, in the hope that they will spread and add to the value of the natural pasturage. Care should of course be taken to avoid the introduction of species likely to be more troublesome as weeds than useful as pasturage.

CULTIVATED FORAGE CROPS.

No forage crops as such are at present cultivated by the Filipinos, excepting barit (*Leersia hexandra*), but a considerable amount of feed is obtained as by-products of crops grown for human food. The most important of these are rice straw, corn leaves, sugar-cane leaves, and peanut vines. Other crops of forage value now sparingly grown for human food include cowpeas, mung beans, seeta beans, two inferior varieties of sorghum, cassava, and yams. To these may be added the extensively grown sweet potato.

While the experience of Filipino farmers demonstrates that a considerable variety of plants useful as forage can be grown with success, the investigations of the Bureau of Agriculture have shown that many more are successful and valuable, while others do not thrive. The present condition and future possibilities of the crops on which any data are available are here briefly discussed, excepting barit, which is elsewhere treated.

The list of successfully cultivated forage crops, or those which it has been demonstrated can be successfully grown, is as follows:

GRASSES.—Barit (*Leersia hexandra*), Guinea (*Panicum maximum*), Pará (*Panicum barbinode*), Rhodes (*Chloris gayana*), molasses (*Melinis minutiflora*), Sudan (*Andropogon halepensis* var.), Tunis (*Andropogon halepensis* var.), Natal (*Tricholæna rosea*).

COARSE FORAGES.—Corn or maize, teosinte, sorghum (including sweet sorghum, Kafir and Milo), sugar cane, pencillaria or pearl millet.

ROOT CROPS.—Cassava, yams, chufas, sweet potatoes, yautia, taro.

LEGUMES.—Cowpeas, soybeans, peanuts, seeta bean (*Phaseolus calcaratus*), bonavist (*Dolichos lablab*), Florida beggarweed, Lyon bean, velvet bean, mung bean (*Phaseolus max*).

CEREALS.—Rice, corn, millet (*Setaria italica*), mayuen (*Coix*

lachryma-jobi var. *mayuen*), broom-corn millet (*Panicum miliaceum*).

Among the forage crops tested which offer little or no promise under Philippine conditions are alfalfa, red clover, white clover, timothy, sainfoin, sulla, berseem, and the cereals wheat, barley, and oats. On several of these the experimental data are very brief and further tests are warranted before reaching final conclusions.

Rice.—This is the great cereal crop of the Islands but the production does not equal the demand so that considerable quantities are imported each year. At the present time about five hundred varieties, according to the investigations of the Bureau of Agriculture, occur in the Philippines. Wet-land rices are usually transplanted, though in the dry season some are broadcasted or drilled; upland rices are always broadcasted or drilled.

Rice is the commonest grain fed to Philippine live stock, usually the unhulled grain or *paláy*, but broken grains, *binlid*, and rice polish, *tiquitiqui*, are also used, the latter extensively.

The total yield of this crop can be enormously increased especially with irrigation, and the Islands should export rather than import rice.

Corn, or maize.—Corn has long been grown in the Philippines, and in some islands, notably Cebu, is the principal cereal used for food. The varieties grown are all flint corns, principally due to the fact that these are more easily kept in storage, suffering less both from mold and weevils. The average yield is low, perhaps not averaging 1,000 kilo per hectare (15 bushels per acre). This low yield, however, is due to poor tillage and lack of seed selection.

At La Granja Modelo, La Carlota, Negros, it was found that three or four crops could be grown in a year, but the crop grown in the rainy season was very difficult to mature. Several American varieties of corn have been tested, of which the Mexican June is most valuable and is now quite largely grown, especially for green corn. In plot experiments yields have been obtained per hectare in kilos as follows: 4,900, 1,300, 1,858, 1,190, 2,840, and 3,381, or a range of 20 to 75 bushels per acre.

The native method of storing corn is to suspend the unhusked ears from a frame covered with a roof of some sort, or better, kept in the house. Shelled corn is much injured by weevils unless stored in insect-proof bins.

There is no question that the yield of corn can be greatly

increased by better cultivation and by seed selection, and it should approximate the average obtained in the United States.

Sugar cane.—The leaves of this plant furnish good fodder and of late years the slender Japanese variety has been much grown in the southern United States as a forage crop. There is practically no doubt that it will succeed as well here, judging from the very short time the plants have been set out. In Florida velvet beans are advantageously grown with the cane, furnishing a combination which makes an enormous crop of fodder for fattening cattle.

Sorghum.—Two native sorghums are cultivated sparingly, the seeds being used for human food. The Bureau of Agriculture has tested amber and orange sweet sorghums, Kafir and Milo. The two former thrive wonderfully, three cuttings being obtained from a seeding. The seed crops are also excellent. Kafir and Milo are reported to have done well, but the former suffered in some cases from the attacks of plant lice. There seems no reason why these, as well as other grain sorghums, should not do well in the dry season, replacing especially the poor native varieties. At the present time amber sorghum is the principal forage grown at the Alabang stock farm.

Teosinte.—The experiments of the Bureau demonstrate that this crop succeeds admirably in the Philippines, but, excepting on very rich soils, can hardly compete with sorghum. The latter is grown by Filipino farmers to a limited extent, but thus far teosinte has not proven popular.

Pearl millet (*Pennisetum americanum*).—The only recorded test of this plant is at Baguio, 1908, where successful results were secured. It may be expected to succeed wherever sorghum does well. In the United States, pearl millet is now but little grown, the sorghums being more satisfactory.

Mayuen.—This is a soft-grained variety of the common Job's-tears, so abundant in the Philippines. Mayuen is commonly cultivated in Burma, but rarely here. It is worthy of serious trials as a grain crop, but no data are available on its value as horse feed.

Oats.—Oats have been tried at Baguio for several years. The plants grow well, one, two, or three cuttings of green forage having been obtained from a single seeding. The yield of grain, however, has been small, and the present outlook is that the crop can not be profitably grown even at the highest altitudes where suitable land occurs.

Guinea grass.—This was introduced by the Bureau in 1907 and has proven a great success, thriving here as strikingly as in Cuba. For the production of green cut feed there is probably no other perennial grass that can equal Guinea, and its high feeding value has been thoroughly proven by long experience. As hay it is difficult to cure, but is readily eaten by horses. Its coarseness, however, will always militate against its use as hay. Guinea grass, as a green feed, has not yet overcome the prejudice in favor of *barit*, where that is grown, but elsewhere is becoming popular.

Rhodes grass.—The marked success with which this grass can be grown in the Philippines is demonstrated by the experiments of the present year, when it was first tested. The detailed data are presented elsewhere in this report. It is perhaps the best grass known for hay production in the Tropics.

Tunis grass.—This was first tested during the present season. It is an erect, slender-stemmed grass growing in tufts, and of very high promise for hay production. Its seeding habits are very good. Owing to the small amount of seed it was tested only at Singalong.

Sudan grass.—This grass was also tested for the first time during the present season and the results are set forth in another page. It shows much promise.

Natal grass (*Tricholæna rosea*).—First tested during the present season at Lamao. It is a grass of excellent habit and quality for hay, but the seeds are fuzzy and somewhat difficult to gather and to sow. It is worthy of thorough trial both for hay and pasturage.

Golden crown grass (*Paspalum dilatatum*).—This grass is a native of Argentine but has for many years been naturalized in the southern United States, where it forms a valuable constituent of pastures, and is occasionally thick enough to cut for hay. In recent years it has been much exploited in Australia. This grass has been tested by the Bureau since 1907 but the results show clearly that its use will be restricted to pasture purposes, and even then it will be valuable only if it spreads. It is remarkable for its ability both to grow in very wet soil and to withstand severe drought.

Pará grass (*Panicum barbinode*).—This was first introduced by the Bureau in 1910 from Ceylon and has been grown at Singalong and Alabang. It is a coarse grass, producing runners often 3 to 6 meters long, which root at the nodes and then produce

erect branches. During the dry season the nodal roots can scarcely penetrate the soil and the stand of the grass is very thin compared with fields in Florida or in the West Indies. In the wet season it does much better, nearly as well as in Florida. It may be expected to succeed much better in wet and swampy land or in Mindanao where the rainfall is more evenly distributed. On account of its coarseness it is difficult to cure, but the hay is of excellent quality. In sandy soil under heavy irrigation it may be expected to succeed as well as in Florida, and it should also be planted in swampy lands where it will produce a large amount of pasturage.

This grass has a different aspect in the Philippines from that which it has in Florida. It may be that the form in Ceylon is somewhat different, and to determine this, American seed should be sown and the two compared.

Molasses or Brazilian grass (Melinis minutiflora).—Another grass first tested during the present season at Alabang, Lamao, and Singalong. It is rather coarse, producing branches which root at the nodes, very leafy, and with slender flowering culms. The whole plant has the odor of molasses, but both horses and cattle eat it readily as soon as they are used to it. Molasses grass does not grow so rapidly as Guinea and if cut too close does not always survive. This grass can not compete with Guinea as green fodder, at least during the dry season, and for hay it cures with difficulty. Its value in pasture remains to be determined as well as its behavior during the rainy period.

Italian rye grass.—Tested at Trinidad garden, Baguio, in 1907 and reported as "quite successful." This grass makes excellent hay and there is strong likelihood that it will succeed in the mountain region. Additional experiments are now under way.

Millets.—Foxtail millet (*Setaria italica*) is cultivated to a limited extent for the grain. This grass may be used as hay, which is satisfactory for cattle, but not desirable for horses. Broom-corn millet (*Panicum miliaceum*) is very rarely cultivated. The grain is mainly useful for human food, but in the United States is sometimes cut for hay. Japanese millet (*Panicum frumentaceum*) is apparently not cultivated in the Islands, but the closely related barnyard millet occurs as a weed in rice fields. Both of these last may be grown for forage, useful as cattle feed. A single experiment with Japanese millet at Singalong is reported as giving a satisfactory yield.

Colorado grass (Panicum texanum).—This was first tested in 1911, being tried at Lamao, Singalong, and Alabang. Planted

in March it grew much the same at all these places, reaching a height of 30 to 40 centimeters and producing abundant seed. Most of the plants headed when only about 10 centimeters high, a dwarfing perhaps due to the season. In the valley lands of Texas the grass volunteers abundantly in cotton and corn fields and yields fine crops of excellent hay. Its value will depend largely on its behaving in a similar way here. The dwarfing so noticeable in the dry season may not occur in the wet season, and it is being further studied to determine this and other points.

Orchard grass.—This grass was tested at Lamao in 1908, but the plants perished during the rainy season. A test at Baguio in 1907 was satisfactory and the grass "considered worthy of further trial." It is very probable indeed that this grass will succeed in the highlands and further trials are now being conducted.

Miscellaneous grasses.—Various grasses were tested in a small way at Baguio in 1908, including timothy, tall meadow oat, yellow oat grass, Italian and perennial rye grass, Kentucky blue grass, Canada blue grass, smooth brome, crested dog's-tail, meadow foxtail, meadow fescue, redtop, and sweet vernal grass. The best results were secured in this test with orchard grass, sweet vernal and yellow oat grass. Many of these grasses are being tried again during the present season. Repeated tests will be necessary before the value of these grasses in the highlands can be fully determined.

Cowpeas.—The true cowpea (*Vigna unguiculata*) seems not to be known to the Filipinos, who, however, cultivate under the name of "sitao" two or three varieties of asparagus bean (*Vigna sesquipedalis*). These are rather viney and much subject to rust. The Bureau of Agriculture has tested various American varieties of cowpea, including Clay, whippoomill, new era, and iron, the last as "Venzuela black bean." The last-named is reported as succeeding excellently and fields of new era grown this year at Lamao were as fine as any seen in the United States. The results indicate that they do better as a rule in the dry season. The catjang (*Vigna catjang*) so extensively grown in India is apparently unknown in the Philippines. Owing to the presence of root knot and other cowpea diseases, it is likely that the iron cowpea and certain iron hybrids, which are strongly disease resistant, will be found most valuable.

Peanuts.—This crop is grown in a limited way, the seeds for food, the herbage for forage either green or cured as hay. Two or three varieties occur, but the best forage variety, the

Spanish, is apparently unknown in the Philippines. In sandy soil this is undoubtedly a very valuable crop to grow, all the experimental plots showing satisfactory yields. At Lamao it is considered a very desirable orchard cover crop as a continuous succession of plants is produced.

Mung, or mongo (Phaseolus max).—This is quite commonly cultivated, the seeds being used for food. At least two varieties occur in the Philippines but many others are known from continental Asia. The plants are much subject to aphid attack, and the varieties now grown are not as satisfactory as cowpeas for forage or green manure. Several other varieties are now under test, including *Phaseolus radiatus*, a nearly related plant which produces the highest priced bean seeds in India. Owing to the fact that these beans are popular with Filipino people, a careful testing of the numerous varieties is desirable.

Velvet bean (Stizolobium deeringianum).—Numerous experiments of the Bureau of Agriculture have shown that this plant is quite as valuable in the Philippines as in Florida, both as a cover crop and for forage.

A closely related plant, the Lyon bean (*Stizolobium niveum*), sporadically cultivated by the Filipinos, is even superior, producing larger vines and more pods, but it is subject to rust, which doubtless injures the plant to some extent.

During the present season these two species are being compared to ten other related species, all of which are doing well, but it is too early to predict their relative value.

Velvet beans are extensively grown in Florida, often with a supporting crop such as corn, sorghum, and Japanese sugar cane, the crop being pastured by animals that are being fattened for the market. In all probability a similar use of the crop will be found valuable in the Philippines.

Bonavist (Dolichos lablab).—A legume of the general habit of the cowpea but more viney, one variety of which is cultivated by the Filipinos under the name of "batao," the green pods being used as a vegetable. There are many other varieties which should be tested, as some are undoubtedly superior. The plant is valuable mainly as a vegetable, but can be grown for forage after the manner of cowpeas.

Seeta bean (Phaseolus calcaratus).—Two varieties of this are sparingly cultivated in the Philippines, the beans being used for food. There are many other varieties known and several are at present under test. The crop resembles mung in a general way and is of similar value.

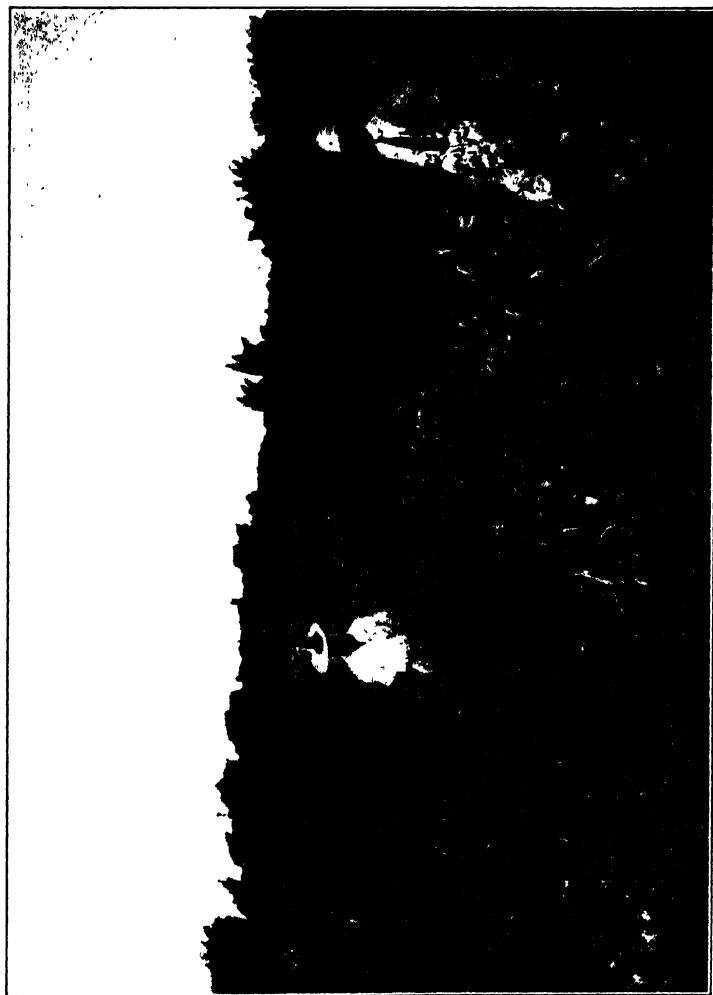


PLATE II — BEGGARWEED (ON RIGHT) AND RHODES GRASS (ON LEFT), TWO-THIRDS GROWN, AT
ALABANG STOCK FARM.

Florida beggarweed.—This was introduced by the Bureau in 1904 and grown successfully. Under the idea that it might become a noxious weed its culture was not continued. The experience with this crop in Florida and the West Indies shows that it is by no means troublesome as a weed. In tests conducted during the present season at Alabang, Lamao, and Singalong, planted in March, the plots grew to a height of 1.7 to 2.2 meters, maturing pods in sixty days. It grows again from the base when cut and volunteers abundantly from scattered seed. It is probable that cuttings of mature size can be made about every sixty days. Stock eat the plants readily either green or cured as hay. As a crop for cover or green manure, this is perhaps the best legume for the Philippines.

Soybeans.—Soybeans are not a native crop in the Philippines, but several varieties have been tried at different times with fair success. During the present season the "Acme" variety was sown in March at Alabang and Lamao. The plants grew normally in every way but are one-third smaller than plants of the same variety in Virginia. Further testing should be carried on with this crop, especially the varieties from southern China, Java, and India. At the present time they can not be recommended for general culture.

Alfalfa.—A number of experiments have been conducted by the Bureau to determine if this crop can be grown in the Philippines. The results show that where the land is limed and inoculation secured the plants will grow during the dry season, but die out in the rainy season.

The results of the experiments read surprisingly like those in Florida, where thousands of trials have been made. On well-drained deep soil, heavily limed, and properly inoculated, one, two, or three cuttings at best may be expected, and then the plants disappear.

It is altogether probable that alfalfa will thrive under irrigation in the dry season on well-drained, heavily limed, inoculated soils. It is very improbable that it can be kept alive through the rainy season. With cheap enough seed such results would justify its cultivation by a dairyman, but hardly by any other type of farmer.

Alfalfa is nowhere grown with any great success in the Tropics, and in any humid region its culture is difficult. These facts should be borne in mind by experimenters, as doubtless many will try to grow the crop.

Clover.—Experiments with clover have been confined to Baguio. Red clover succeeds fairly well but not sufficiently so to justify cultivation. Alsike is reported to have done well in 1908. White clover persists fairly well about the experiment station, but does not spread. Rarely a plant may be found about Manila. The moderate success had with clovers indicates that they have some possibilities in the higher altitudes. Their failure to seed and volunteer reduces their prospective value greatly.

Common vetch (*Vicia sativa*).—Tested at Baguio in 1907, where it made a good growth and produced abundant seed.

Hairy vetch (*Vicia villosa*).—Grown at Baguio in 1908, where it grew well but produced no seeds.

Japan clover (*Lespedeza striata*).—Several attempts have been made to establish this plant on the pasture lands about La Trinidad stock farm, altitude 1,500 meters, as well as in the lowlands. All these attempts thus far have failed.

Sulla (*Hedysarum coronarium*).—This legume was tested at Singalong in 1902, 1903, and 1904. The plants were weak and grew but 15 centimeters high. Lack of inoculation may be a factor in these results, but there is little chance that sulla can be made to succeed under Philippine conditions.

Sweet potatoes.—This crop is abundantly grown for human food. Most of the native varieties are inferior and doubtless can be replaced by better sorts. Sweet potatoes are valuable for forage, the tops as well as the roots being eaten by cattle. In yield they may be expected to approximate any other tropical root crop.

Taro (*Colocasia antiquorum*).—Commonly cultivated for human food, but useful also as forage for fattening swine.

Cassava.—This American plant is thoroughly naturalized in the Philippines and grows wild in waste places. It is but little cultivated and no superior varieties occur in the Islands at present. It would seem that there are great possibilities in this crop, especially in sandy soils, for the production of both forage and starch.

Chufas.—This plant produces splendidly in the Islands, but is not much cultivated. In sandy soils it is one of the best pasture plants to grow to fatten hogs.

Yams.—Several species of yams are cultivated, especially *Dioscorea alata*, while others occur wild; as feed for fattening hogs they are comparable to other starchy roots.

Yautia (*Xanthosoma* spp.).—The yautia has been introduced by the Bureau and tested in a small way. The results indicate

that it will far outyield the taro so commonly cultivated, and furthermore the tubers are much superior.

Jerusalem artichokes.—These were tested by the Bureau in 1904 but the results were very unsatisfactory and indicate that this crop has little or no value in the Philippines.

There is practically no doubt that this list can be considerably extended by the use of crops grown in India and other tropical regions, most of which it is planned to test at once. These include teff (*Eragrostis abyssinica*) for hay, ragi millet (*Eleusine coracana*), kulthi (*Dolichos biflorus*), guar (*Cyamopsis psoralioides*), catjang (*Vigna catjang*), moth bean (*Phaseolus aconitifolius*), adsuki bean (*Phaseolus angularis*), and various varieties of sorghum, especially Guinea corn. Certain leguminous trees which produce pods useful as forage are also included, among them the Hawaiian mesquite or algaroba (*Prosopis* sp.), the carob (*Ceratonia siliquosa*), and several species of *Inga*.

LIVE STOCK OTHER THAN HORSES.

The accompanying table of statistics, prepared by Dr. F. C. Gearhart, presents the best available information concerning Philippine live stock. The data for 1891 are from the annual official document *Guía Oficial de Filipinas* and they are not regarded as accurate; those for 1903 are from the Census report taken under the direction of the Philippine Commission; and those for 1910 are collected by the statistical division of the Bureau of Agriculture. These last figures are smaller than they should be as a number of municipalities did not report during the year 1910.

Taking the figures at their face value and comparing 1891 with 1910 there has been no decrease except in the case of cattle, this undoubtedly due mainly to the rinderpest which destroyed a large part of the range herds. Since 1903, however, cattle have nearly doubled in number, in spite of the fact that rinderpest has been constantly in the Islands.

The figures for carabaos show a small increase for each census, which is interpreted as meaning that the natural increase considerably exceeds the loss from disease.

Swine, goats, and sheep all show large increases.

It must be borne in mind that all of these figures are more or less inaccurate, in some cases glaringly so. But making due allowance for all of these, there can be but little doubt that the main facts are in general accord with the figures.

Number of carabaos, cattle, horses, 1891, 1903, 1910, and swine, goats, and sheep, 1903, 1910 in Philippine Islands (approximately).

Province	Carabaos			Cattle.			Horses.		
	1891	1903	1910	1891	1903	1910	1891	1903	1910
Philippines	595,632	640,871	713,121	402,630	127,559	242,398	214,266	114,171	215,674
Abra	3,370	6,331		2,238	1,029		4,014	7,049	
Agusan			801			327			202
Albay	26,178	10,774	8,191	15,980	985	1,133	11,923	6,774	4,241
Ambo Camarines	37,769	7,428	12,906	17,682	493	1,218	21,906	821	495
Antique	19,896	13,147	13,842	11,287	1,744	5,532	1,341	923	270
Basilan	100	132		359	186		40	45	
Bataan	594	4,666	5,895	800	20	266	300	94	194
Batanes			1			5,358			19
Batangas	13,506	8,858	12,589	17,469	15,331	33,797	12,427	15,598	20,088
Benguet	2,023	73		2,871			685	167	
Bhol	2,064	16,325	25,384	12,828	2,321	8,023	23,400	2,138	2,351
Bohol	1,000	22,937	30,765	900	314	1,342	2,500	1,781	2,651
Bohol	16,964	28,136	29,206	12,761	22,182	10,784	5,245	6,904	7,008
Capiz	35,105	13,784	28,793	7,181	580	8,908	1,649	682	1,886
Cavite	6,140	7,801	8,672	1,988	1,088	3,245	4,746	3,316	4,605
Cebu	27,066	38,204	29,839	6,532	1,960	11,428	3,050	8,427	90,903
Cotabato	100	138		1,400	98		30	26	
Dapitan		3,659			126			123	
Davao	300	2,312		4,500	5,965		100	383	
Ilocos Norte	7,585	32,129	35,532	7,998	3,833	6,938	8,614	11,142	11,916
Ilocos Sur	1,000	28,419	40,889	13,000	9,053	13,300	7,400	3,594	9,770
Iloilo	11,115	36,823	36,666	10,383	4,693	8,002	6,067	1,798	1,383
Isabela	7,798	14,778	21,756	812	980	2,246	7,161	2,783	3,734
Jolo		5			39			3	
La Laguna	13,736	8,237	12,873	11,100	583	1,715	6,801	5,841	6,409
La Union	7,539	25,041	18,064	5,257	2,053	3,703	6,385	2,019	1,826
Lepanto Bontoc	5,579	359		1,771	668		1,118	269	
Leyte	50,800	23,795	20,645	30,000	3,523	7,070	7,000	4,311	3,085
Mashate	10,800	1,546		65,490	1,837		4,940	4,797	
Mindoro	8,797	6,640	5,211	13,600	12,147	13,581	4,208	2,505	2,755
Misamis	17,668	10,638	5,858	17,500	798	1,289	3,000	7,110	2,787
Moro			10,263			15,485			3,897
Mountain			11,393			14,628			3,024
Nueva Ecija	2,760	11,361	23,315	1,250	418	2,998	4,598	539	718
Nueva Vizcaya	2,000	2,616	4,230	2,000	254	680	5,000	318	489
Occidental Negros	129,394	42,707	31,384	62,915	4,282	10,769	10,463	2,017	1,516
Oriental Negros	9,473	18,429	11,871	5,987	2,276	3,821	870	4,295	4,660
Palawan			4,810			8,738			1,971
Pampanga	42,200	28,706	30,019	780	276	1,399	4,200	1,741	2,628
Pangasinan	16,961	53,836	68,129	3,186	3,136	12,108	7,459	1,735	3,779
Paragua	1,609	2,987		3,626	5,240		134	174	
Paragua Sur		177			694			17	
Rizal	4,387	9,975	12,928	750	421	799	1,957	10,203	1,669
Romblon	3,985	10,125		8,400	4,582		1,320	1,458	
Samar	10,313	12,080	6,511	20,494	1,161	1,249	485	713	1,102
Siasi		6						4	
Sorsogon			10,544			5,981			3,166
Surigao	9,000	6,507	8,171	400	409	524		888	1,942
Tarlac	6,000	21,836	28,428	2,000	564	1,320	9,000	662	1,112
Tayabas	17,000	17,935	18,165	13,008	4,803	8,858	8,500	11,801	6,214
Zambales	1,025	20,245	12,040	2,150	1,854	3,886	4,000	3,116	1,133
Zamboanga	1,500	1,292		2,160	92		300	554	

Number of carabaos, cattle, horses, etc.—Continued.

Province.	Swine.		Goats.		Sheep	
	1903	1910	1903	1910	1903	1910
Philippines.....	1,179,371	2,066,605	124,334	407,087	30,428	88,760
Abra.....	7,933		833		202	
Agusan.....			4,885	373		30
Albay.....	14,869	50,208	1,374	12,082	117	247
Ambos Camarines.....	14,337	34,527	2,935	21,681	261	1,153
Antique.....	9,426	28,254	560	6,326	216	586
Basilan.....	157		18			
Bataan.....	6,623	7,417	814	1,725	132	635
Batanes.....		2,560		991		229
Batangas.....	58,943	87,110	3,108	10,743	138	255
Benguet.....	79		155		56	
Bohol.....	46,007	520,453	435	4,675	185	276
Bulacan.....	64,296	59,278	1,295	6,674	312	717
Cagayan.....	46,258	26,162	2,602	5,660	973	2,090
Capiz.....	12,284	43,699	2,797	39,987	327	1,846
Cavite.....	30,428	34,032	302	1,761	72	189
Cebu.....	150,905	263,440	23,188	49,235	2,087	6,198
Cotabato.....					33	
Dapitan.....	1,836		125		9	
Davao.....	2,401		100		27	
Ilocos Norte.....	48,981	37,708	5,458	12,054	1,979	5,996
Ilocos Sur.....	24,343	70,704	7,260	25,154	2,888	6,040
Iloilo.....	41,222	86,717	3,025	24,447	1,142	7,808
Isabela.....	27,109	14,822	422	2,389	333	1,119
Jolo.....	35					
La Laguna.....	82,047	24,303	556	3,681	85	204
La Union.....	25,201	18,739	11,811	13,988	2,078	3,078
Lepanto Bontoc.....	286		116		58	
Leyte.....	36,030	59,736	1,483	13,455	628	2,162
Masbate.....	5,516		156		51	
Mindoro.....	2,444	6,880	225	1,815	2	
Misamis.....	23,784	23,077	1,961	5,045	813	1,173
Moro.....	17,738			1,915		507
Mountain.....			24,748			1,787
Nueva Ecija.....	37,855	57,333	1,290	3,428	329	1,031
Nueva Vizcaya.....	5,006	5,366	39	730		94
Occidental Negros.....	40,285	45,615	6,442	25,065	6,911	22,032
Oriental Negros.....	51,904	57,136	5,945	20,060	1,740	3,580
Palawan.....		3,028		498		24
Pampanga.....	65,631	49,471	9,390	19,010	4,408	4,585
Pangasinan.....	61,176	100,310	16,376	20,159	616	2,118
Paragua.....	1,704		232		34	
Paragua Sur.....	175		33			
Rizal.....	26,666	19,369	1,551	2,500	115	185
Romblon.....	7,761		1,108		40	
Samar.....	21,583	25,211	679	3,693	169	218
Siassi.....						
Sorsogon.....	9,547	36,210	734	7,257	57	813
Surigao.....	13,148	24,763	374	2,508	143	182
Tarlac.....	36,317	58,961	4,329	18,469	914	7,830
Tayabas.....	84,272	35,815	1,022	5,866	60	91
Zambales.....	26,990	20,800	656	2,363	573	1,649
Zamboanga.....	6,164		1,274		165	

THE OUTLOOK FOR ANIMAL HUSBANDRY.

There is perhaps no other tropical region in which the possibilities for live stock are as great as in the Philippines. Owing to the present comparatively sparse population there are immense areas of unoccupied land and many thousands of hectares of this is covered with a dense growth of pasturable grasses. These once supported numerous herds of cattle which were largely swept away by the rinderpest during the past decade. There can be little doubt that this disease will soon be entirely eradicated if the present active measures are maintained. Already most of the islands are entirely free from this disease, and offer an alluring field to stockmen. Reasonable precautions will of course have to be maintained to prevent the introduction and spread of diseases, but after all the danger from these is but little greater than in temperate climates, and is controllable by similar measures.

The great prosperity of the cattle industry previous to the introduction of rinderpest is an indication only of the possibilities. The demand for work animals both carabaos and cattle is great and prices were never so high. Beef is now almost wholly imported, but it could be raised here as cheaply as anywhere, and by finishing the animals on cultivated forage should be of high quality. The beef raised in Java is considered as fine as that produced in any country.

Cultivated forage crops can nowhere be produced more cheaply than in the Philippines and crops of one sort or another may be had at any season of the year. This is an important point as it permits finishing cattle by pasturing, much the cheapest method. The variety of crops available as finishing feeds is very great, but perhaps the following will include the most valuable; corn and cowpeas, sorghum and cowpeas, Japanese sugar cane and velvet beans.

While the risk from disease is somewhat greater now than if rinderpest were extirpated, it should not be a serious factor on islands where the disease does not occur, and the highest price for work animals will be secured by those who raise them first.

In regard to hogs, sheep, and goats, the condition of affairs as regards disease is much simpler than with cattle. It can safely be said that these animals can be as cheaply raised in the Philippines as any place in the world.

HORSES IN THE PHILIPPINES.

Horses outside of the Army are used in the Philippines principally in the cities and for pleasure purposes. Farm animals are largely carabaos and cattle. The native horses are small animals averaging 300 to 350 kilos in weight. They are very active and considering the general poor care they receive do a surprising amount of work. The origin of these animals is involved in considerable obscurity, but the general belief is that they contain some Arabian and perhaps Chinese blood. Their small size is probably due to poor care and promiscuous breeding in addition to any influence the climate may have had. Efforts are being made to improve these animals in size and the results thus far are very encouraging.

The statistical figures presented in the previous table show that horses are now about the same in number as in 1891. In 1903 the figures were much less, due to the enormous losses from surra, and to a less extent to the ravages of war. Natural increase and the much reduced losses from disease have again brought their numbers up to the estimate of 1891, a conclusion regarded as essentially accurate.

GRASSES FOR HAY.

None of the native Philippine grasses possess any great promise as hay plants, though several deserve trial. Many temperate grasses and clovers have been tried in various parts of the Islands. These include timothy, alfalfa, and red clover. None of these have shown sufficient adaptability to be of value as crops, though there is reason to believe that several temperate grasses notably perennial and Italian rye grasses, red-top, orchard grass, and tall meadow oat grass will succeed on the higher mountain plateaus. In such regions possessing a fairly long dry season, as in Benguet, hay culture may prove remunerative.

In the lowlands several tropical grasses have been grown with marked success in plots and there can be no doubt as to their high usefulness for green fodder, and when climatic conditions permit for hay production as well. On account of the comparatively high atmospheric humidity in the Philippines, even during the dry season, only slender stemmed grasses can be easily and satisfactorily cured into hay. This fact would seem to eliminate the coarse grasses like Guinea and Para and such legumes as Florida beggarweed, cowpeas, and peanuts, though

all of these grow well in the Philippines and produce, when cured, very palatable hays.

In the light of present knowledge, mostly secured from experiments during the present season, the best hay grasses known for the Philippines are Rhodes grass, Tunis grass, and Sudan grass, probably in the order indicated.

Rhodes grass (Chloris gayana).—This grass is grown with great success in such widely distributed regions as South Africa, Florida, Hawaii, and Australia. Though known for many years, its high value as a tropical hay grass has only in recent years been thoroughly appreciated. On account of its slender stems it cures readily and besides makes a very sweet and palatable hay. Trial plots of it have been grown during the present season of 1911 at Lamao, Singalong, and Alabang.

At Lamao the seed was sown November 26, 1911, and the plants set out December 18, 30 centimeters apart in rows 90 centimeters wide. It began heading January 20 and on February 14 was 90 centimeters high. It could have been cut as hay about February 1 but was not cut until March 7. It was cut again April 25 in full head and a third time June 9. The second cutting yielded less than the first and the third less than the second.

At Singalong the seed was sown in rows March 31. It was 75 centimeters high May 28 and in full head, when one plot was cut.

The grass was also sown at Alabang in rows on March 31. It began to head May 14 and was fully headed May 22. None was cut until May 27 when it averaged 90 centimeters in height.

From the above data it seems likely that this grass can be cut every sixty days, so that if it is planted in November, cuttings may be expected in January, March, and May during the dry season.

In stormy weather this grass lodges somewhat but not enough to interfere with mowing.

Tunis grass (Andropogon halepensis var.).—This is a new grass closely related to Johnson grass but not possessing root-stocks and therefore easy to control. Only a limited amount of data are available as it has been tested in the United States only one season. Seed was sown at Singalong, February 28, 1911, in rows, and the plants were fully headed out April 4 at a height of 90 centimeters. The hay cured thoroughly in four days. A second cutting was obtained May 28.



PLATE III —SUDAN GRASS, ALABANG STOCK FARM.

No data are available as to the feeding value of this grass but they are doubtless identical with Johnson grass. The stems are slender and erect, usually about 50 from a plant, and there is no lodging even in heavy weather.

It can be sown either broadcast or in rows, in the latter case never becoming too coarse as its maximum height is about 100 centimeters. The seed habit is excellent and the grass one of much promise for hay production. While the data available are very limited it would appear that cuttings can be obtained from this grass about every two months, thus giving three cuttings during the dry season.

Sudan grass (*Andropogon halepensis* var.).—This is a new grass first secured by the United States Department of Agriculture in 1908. It has proven to be of high value in Texas and other southern states where it must be sown annually as it does not survive the winters. It has been tested during the present season at Alabang, Singalong, and Lamao, both in cultivated rows and seeded broadcast.

At Singalong it was seeded February 28 and the rows were fully headed on April 15, at which date some were cut. The second crop from the roots was fully headed out on June 24. The average height of the grass in rows was about 2 meters, the culms too coarse to permit of easy curing.

In the broadcasted plots the grass, except at the margins, grew more slowly, being headed out at an average of 100 centimeters on April 15. The seeding was too thick but the stems and leaves fine enough for easy curing. At Alabang and Lamao much the same results were secured.

From the data available it would seem to be clear that Sudan grass grows too coarse when planted in cultivated rows to be readily cured into hay. When broadcasted the difficulty can be overcome by the proper thickness of seeding and doubtless the same results secured on relatively poor soils. In rows, cuttings can be secured within sixty days of seeding, and approximately every sixty days thereafter. Thickly drilled or broadcasted the cuttings will be less frequent.

Sudan grass is readily eaten by all classes of live stock and a very small amount of experience indicates that the hay is also palatable and nutritious. It produces good seed in abundance.

Natal grass (*Tricholæna rosea*).—Several plots of this were planted but the seed failed to germinate. A second lot was

planted at Lamao in boxes March 21 and transplanted to the field April 21. June 2 it was 80 to 90 centimeters high and beginning to head. It is an erect slender stemmed grass but does not grow very rapidly. The seed habits are not very good and there is some difficulty usually in securing a good stand. When this grass volunteers and spreads it is of high value and produces hay of excellent quality. The grass is evidently well adapted to Philippine conditions and may prove of much value especially in sandy soils.

There is reason to believe that two or three other grasses may prove valuable for hay, but experiments with these remain to be conducted. These include Italian rye grass (*Lolium italicum*), especially in the highlands, and Teff (*Eragrostis abyssinica*).

With the data now at hand the production of hay on a large scale will be undertaken during the next dry season with Rhodes grass, Tunis grass, and Sudan grass, and on a smaller scale with other grasses so as to secure full data as to yield, ease of curing, and value as horse feed. Detailed outlines of these proposed experiments are attached to this report.

THE PRODUCTION OF HAY IN THE PHILIPPINES.

The most acute forage need in the Islands at present is that of hay for use of the Army horses and city stables. At the present time all of this hay is imported from America and Australia. The principal hays used and the present costs of delivery to the Army at Manila are as follows:

	Per ton
Timothy	\$25.52
Kansas prairie	15.48
California wild oat	20.90

Alfalfa hay is quoted by local dealers at \$22.40 per ton.

Practically no hay is now produced in the Islands, though small quantities of the following have been cured, namely, corn-blade fodder, Guinea grass, luyaluya (*Panicum repens*), barit (*Leersia hexandra*), and barili (*Panicum stagninum*).

The production of corn-blade fodder seems to be entirely practicable and efforts are now being made by the Bureau of Agriculture to induce the farmers to prepare this product, which at present is largely wasted. Guinea grass cures with considerable difficulty, but makes a very good though coarse hay. Barili hay has proven to be very unpalatable, horses refusing to eat it. Luyaluya makes a hay of very mediocre quality while

barit, though making a better hay, is too small and too valuable cut green to be used.

The curing of hay presents no great difficulty during the dry season in the sections where this dry period is well marked. The humidity of the air is rather high; however, that of Manila during the dry season being about the same as Washington in summer. This dry period is well marked in central and western Luzon and apparently equally so on the west coasts of Mindoro and Panay, and nearly as well in many other localities.

When the market facilities are considered, the best opportunities for commercial hay growing at present are in Luzon. The highest yields will be secured where irrigation can be practiced and two or three cuttings obtained, while not more than one can be expected on unirrigated lands. From the available records the region of least rainfall during the dry season—November to May, inclusive—is in northwestern Luzon in the Provinces of Ilocos Sur and Union, but nearly as dry are the provinces of central Luzon.

The mean rainfall record for important places in the Philippines is shown in the following table:

Mean monthly rainfall, in millimeters, at important stations.

Provinces.	Stations	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Number of years.
Cagayan, Luzon	Apatti	213	247	45	37	94	129	145	233	303	306	277	218	11
Ilocos Sur, Luzon	Tuguegarao	1,572	17	8	12	73	171	184	126	288	285	333	103	6
Nueva Vizcaya, Luzon	Vigan	2,134	13	1	3	73	55	136	474	453	132	57	4	14
Union, Luzon	Bayombong	1,186	34	29	37	10	134	156	474	178	132	107	77	8
Benguet, Luzon	San Fernando	2,266	12	2	4	10	160	362	536	463	357	21	6	5
Pangasinan, Luzon	Baguio	4,001	33	6	21	113	479	549	764	899	421	132	21	4
Tarlac, Luzon	Dagupan	2,441	7	14	17	37	439	584	391	408	359	91	13	5
Nueva Ecija, Luzon	Tarlac	1,901	4	8	33	73	172	268	395	258	377	207	35	5
Pampanga, Luzon	San Isidro	1,784	17	4	14	24	201	217	341	278	360	179	93	10
Zambales, Luzon	Arayat	1,690	17	5	8	149	259	373	212	307	223	59	38	8
Bulacan, Luzon	Masinloc	3,954	8	0	5	85	125	135	992	518	518	247	63	4
Rizal, Luzon	Marilao	2,103	11	6	8	48	154	360	545	372	290	183	59	41
Laguna, Luzon	Manila	1,926	28	10	17	31	103	249	368	350	368	190	131	58
Tayabas, Luzon	Batang	1,298	7	18	0	9	62	294	290	125	148	132	46	175
Camarinas, Luzon	Tayabas	1,449	185	42	60	23	99	83	96	73	116	239	293	195
Albay, Luzon	Nueva Caceres	1,818	105	57	54	120	76	178	194	155	268	199	225	183
Sorsogon, Luzon	Albay	2,960	233	168	229	155	168	207	266	242	299	212	301	457
Samar	Gubat	2,908	293	191	114	100	138	114	130	99	270	341	540	572
Leyte	Palanc	1,445	192	87	30	48	75	120	129	254	130	163	57	3
Cebu, Panay	Catibogan	1,955	256	210	33	128	99	128	85	182	256	218	200	155
Iloilo, Panay	Tacloban	2,170	213	143	76	188	178	238	110	213	184	171	254	250
Antique, Panay	Ormoc	2,258	229	75	82	78	50	196	290	290	334	266	165	147
Negros Occidental	Capiz	3,859	201	118	13	62	189	410	451	383	388	348	446	5
Cebu	Iloilo	2,188	50	20	25	51	172	209	549	327	280	261	125	115
Bohol	San José de Buenavista	2,378	26	0	4	60	114	324	571	860	459	308	94	54
Surigao, Mindanao	La Carlota	2,100	86	48	10	29	117	379	329	281	275	199	127	9
Agusan, Mindanao	Tuburan	2,361	113	53	47	229	304	358	378	392	350	199	127	9
Misamis, Mindanao	Cebu	1,389	113	43	60	31	99	180	173	148	176	181	123	160
	Tagbilaran	2,480	109	109	4	383	140	173	148	176	181	123	160	11
	Surigao	2,367	299	290	189	365	176	146	117	176	181	123	160	11
	Butuan	1,998	235	115	58	77	146	123	173	145	222	332	416	5
	Balingasag	1,724	70	8	27	47	146	123	173	145	222	332	416	5
	Cotabato	2,140	16	99	95	145	195	229	339	314	225	203	326	4
	Davao	2,028	136	110	118	170	195	296	347	302	232	191	128	117
	Zamboanga	905	25	38	25	42	109	112	80	83	96	125	77	6

It is practically certain that air-cured hay can be prepared during the dry season much more cheaply than is possible by any system at present known for curing by artificial heat. Furthermore it is exceedingly doubtful if artificially cured hay can possibly be produced in the Philippines at present Manila prices of imported hay. It would seem therefore that the practical production of Philippine hay is limited to the dry season in the most favored sections of the Islands, where a curing season of about five months can be depended upon. Whether it will be most profitable to keep the grass growing throughout the wet season or to rotate it with rice or other crops can be determined only by experiment.

Such experiments it is planned to conduct at once on lands in Tarlac Province, Luzon, under the recently completed San Miguel Irrigation Canal, where very favorable conditions as regards land, climate, and transportation are combined.

The successful commercial growing of hay in the Philippine Islands depends on three conditions: (1) Grasses that will yield palatable hay; (2) the possibility of curing the hay so that it will keep in storage; (3) the profitableness of the crop compared with other field crops.

In regard to the first consideration several grasses meet the requirement so that the problem becomes limited to determining which is the very best. Satisfactory curing requires that the moisture content of the hay be not greater than 15 per cent. In small tests this has been accomplished with comparative ease and during the dry season in the most favorable sections there is but little doubt that it will be just as practicable on a field scale.

It is confidently believed that three cuttings can be obtained with irrigation from Rhodes and other grasses during the dry season, yielding at least 7 tons per hectare. Even a yield of 3 tons per hectare will be much more profitable than dry-season rice at average yields.

On the whole the outlook for successful hay production in the Philippine Islands is exceedingly good and the further investigations herein proposed should be prosecuted without delay.

GRAINS AND OTHER CONCENTRATED FEEDS.

The cereal grains at present produced in the Philippines are rice and corn. The experience of the cavalry during field operations as well as recent experiments show clearly that palay (unhulled rice) can replace the oat ration wholly or partly. The Dutch army horses in Java are fed wholly on palay and green

grass. It is desirable to conduct more exhaustive experiments on the value of palay as a grain ration, but there is practically no doubt that it is satisfactory and economical and should be used in place of a part of the oats at least.

Only flint corns are grown in the Philippines in quantity and for satisfactory feeding the grains must be cracked. The limited experiments of the Forage Board indicate that cracked corn can replace one-half of the oat ration with satisfactory results. There is doubt as to whether this grain would answer in field operations owing to the liability of spoiling from mold, but there can be but little question of its availability and economy at Army posts. Philippine-grown corn can doubtless be secured in any quantity when once a demand for it is established, and probably at about the same prices as corn commands in the States.

In regard to oats and other temperate feed grains such as barley, rye, and buckwheat it is not improbable that these may be grown to maturity in the higher altitudes. It is not at all likely, however, that they can ever be grown cheaply enough to compete with the imported grains, both on account of the limited amount of suitable land and the relatively low yields that may be expected.

Grain sorghums such as Kafir, Kaoliang and Guinea corn can undoubtedly be grown in the Philippines, but are scarcely as desirable for horse feed as ordinary corn.

Mayuen, a cereal much grown in Burma and to a very small degree in the Philippines, is a possibility worth serious experiments. Nothing, however, is known of the value of the grain as horse feed.

Various beans can probably be grown in the Philippines cheaply enough to use as feed. Among these are horse gram or Kulthi (*Dolichos biflorus*) and guar (*Cyamopsis psoralioides*). The subject, however, requires investigation both as to growing of the crops and their desirability as feeds. Inasmuch as both have to be crushed to feed, they can probably never be used in Army field operations.

In the way of products from other crops the following concentrated feeds will doubtless become important in the future, namely, molasses, copra cake, and lumbang cake, the latter from the oil nuts produced by *Aleurites moluccana*. At the present time practically none of these are available. A limited amount of brewers' grain is produced at breweries and distilleries, but this is now used mainly as feed for swine and carabaos.

NOTES ON NATIVE AND NATURALIZED PASTURE PLANTS.

There are, excluding the bamboos, about 215 species of grasses recorded from the Philippines. Many of these are rare or local species and others are so coarse or limited to shady woods so that they have little or no value as pasturage. The following brief notes are mainly based on personal observations and inquiries. The total amount of reliable information on the relative value of the different natural grasses and legumes is very limited principally because practical stock raisers are so few in number at present. From the standpoint of quality of pasturage there seems little doubt that the most valuable pasturage is afforded by Bermuda, *Andropogon aciculatus*, and manimanihan (*Alysicarpus*). On cultivated ground various species are *Panicum*, especially *P. colonum*, *P. flavidum*, and *P. distachyum*, and the species of *Digitaria* are also important.

None of the truly native grasses or other forage plants seem worthy of cultivation in comparison with other known grasses of proven quality, but several deserve trial. Notes are here given on about 60 species. For their identification thanks are due Mr. E. D. Merrill, of the Bureau of Science:

Andropogon aciculatus Retz.

Common especially in sandy or gravelly soil forming a dense turf. Eagerly eaten by horses as well as cattle. The seeds are very sharp pointed so that stock avoid it when headed out. It is stated that the barbs will penetrate the legs of horses often causing soreness. At Hongkong this is the prevailing lawn grass.

Andropogon contortus L.

A common grass easily distinguished when in bloom by the long awns twisted together. It is grazed by stock before the blooms appear, but the long awns make it objectionable.

Andropogon halepensis propinquus (Kunth) Merrill.

A coarse grass in large clumps 2 to 3 meters high, growing especially in well-drained soil. It is a close relative of Johnson grass, but unlike that does not become troublesome as a weed and owing to its coarseness stock eat it but little.

Andropogon intermedius haenkei (Presl) Hack.

Occurring scattered on the borders of rice paddies and in cultivated ground. It is erect and slender, 60 to 80 centimeters high. Were it not for rather poor seed habits it would be worth testing as a hay grass.

Andropogon nitidus Vahl.

Common in the sandy soil of central Luzon and also occurring on the other islands. It usually grows mixed in cogon, but sometimes occupies considerable patches in nearly pure growths.

Andropogon serratus Thunb.

Very like the preceding species, of which, indeed, it is often considered a mere variety.

Andropogon sericeus R. Br.

Often abundant in well-drained soil, sometimes forming nearly pure growths in rice paddies. In Australia this is considered a very valuable pasture grass.

Apluda mutica L.

A tall rather woody grass often abundant. Eaten only when young by cattle and carabaos.

Arundinella setosa Trin.

A tall erect grass not uncommon in Benguet, but stock are said not to be fond of it.

Axonopus semialatus (R. Br.) Hook. f.

A common grass about Baguio, but also occurring at low altitudes.

Centotheca malabarica (L.) Merrill.

A handsome erect grass in shady places, but seldom abundant.

Chloris barbata (L.) Swartz.

Common in waste ground about towns, but eaten by animals, especially horses, only when young. Introduced from America.

Coix lachryma-jobi L. Job's-tears.

A coarse branched grass reaching a height of 2 meters, the hard white seeds commonly employed for bead work. A soft-seeded variety, the mayuen, is rarely cultivated for its grain. It furnishes a coarse but fairly good fodder for cattle.

Cynodon dactylon L. Bermuda grass; Spanish, *Gramma*.

Bermuda grass is the most commonly used lawn grass in the Philippines and also occurs frequently in rice paddies and in heavily grazed upland pastures. In a few towns it is cut green and sold in bundles. Bermuda rarely grows as luxuriantly in the Philippines as in the United States, perhaps due to being a different variety. At any rate it is desirable to grow the American form in comparison. It is one of the most valuable tropical pasture grasses.

Cenchrus echinatus L. Sand-spur.

This spiny-headed grass is introduced from America and is common about the towns. Cattle and horses eat it readily, notwithstanding the spiny heads.

Digitaria sanguinalis (L.) Scop. Crab grass.

Common in cultivated lands as is the closely related but larger *D. consanguinea* Gaudich. Crab grass is commonly cut for hay in the southern United States, and also readily pastured by all grazing animals. It is scarcely valuable enough to utilize for hay, however, excepting where it volunteers.

Dactyloctenium ægyptiacum (L.) Willd.

Much like *Eleusine indica*, but hardly as common. Dekker considers it one of the best grasses for horse feed in Java, but observations in the Philippines do not accord it such high value. It is a rather weedy grass, common also in the southern States where it has never been considered of much importance.

Diplachne fusca (L.) Beauv.

Occurs sparingly about Manila, probably introduced from America.

Eleusine indica (L.) Gaertn. Finger grass.

A common weedy grass in cultivated ground and waste places. In the United States this grass is esteemed as of little value and Philippine animals do not seem fond of it.

Eragrostis elegantula (Kunth) Steud.

A tall species not uncommon in sandy soil in central Luzon, but not abundant enough to be of much value.

Eragrostis interrupta (Lam). Doell.

A tall erect grass occurring infrequently in moist places.

Eragrostis spartinoides Steud.

In sandy soil; only seen in occasional clumps.

Eragrostis tenella (L.) R. & S.

A small common grass in lawn and waste grounds especially in sandy soils.

Eragrostis viscosa (Retz). Trin.

Very similar to *E. tenella* but much less common.

Eriochloa ramosa (Retz). Kuntze.

Quite common in low ground and grazed by carabaos.

Ischæmum arundinaceum radicans Hack.

Abundant in the pine region of Benguet and considered at Trinidad stock farm the most valuable of all the mountain grasses.

Ischæmum muticum (L.).

A seashore grass but not abundant. At Surigao it was observed grazed by cattle.

Ischæmum rugosum distachyum (Cav.) Merrill.

A common grass in rice paddies and readily eaten by carabaos.

Leersia hexandra Swartz. *Zacate*; Tagalog, *barit*.

Commonly cultivated about the Philippine cities and sold green in bundles for horse feed. It is grown in paddies which can be irrigated at will. These are replanted when they become too weedy. The ground is plowed and thoroughly puddled, and the grass planted by sticking the culms thickly in the muddy soil. It is cut when about 30 centimeters high and much care is used in its cultivation, fertilizers being used and hand weeding practiced.

Leptochloa chinensis (L.) Nees.

A rather infrequent grass in wet places and in shallow water, observed most abundantly in Tarlac Province. It is said to be eaten greedily by horses. It would be worth while perhaps to test its value under cultivation in comparison with *barit*.

Oryza sativa L. Rice.

The volunteer rice in paddies either from the root or from grain often furnishes a large part of the pasturage on such lands.

Panicum amplexicaule Rudge.

A swamp species often intermixed in "barili" (*Panicum stagninum*).

Panicum auritum Presl.

A tall species in wet ground.

Panicum crus-galli L. Barnyard millet.

Common as a weed in rice fields where it is troublesome. All live stock will eat this grass when green but it is not considered especially desirable for hay. Horses should not be fed more than a part ration of this grass as it affects them in the same way as does common millet.

***Panicum colonum* L.**

Abundantly volunteering in cultivated fields and eagerly eaten by cattle and horses.

***Panicum distachyum*. F. Vill.**

A low creeping grass occurring principally in cultivated ground, apparently forming good pasturage.

***Panicum flavidum* Retz.**

A common grass especially about villages. Readily eaten by all classes of live stock.

***Panicum indicum* L.**

A species in wet ground but apparently little eaten by animals.

***Panicum paludosum* Roxb.**

A tall aquatic species often mixed in "barili" (*Panicum stagninum*).

***Panicum patens* L.**

A rather common grass in moist rather shady places. It is not of much forage value.

***Panicum pilipes* Nees & Arnott.**

A small shade grass often forming pure growths in large patches. Readily eaten by cattle and carabao.

***Panicum repens* L. Tagalog, *luyaluya*.**

The most abundant grass in rice paddies and low moist lands, often forming nearly pure growths. The herbage is rather leathery, but still it is readily eaten by carabaos. A small amount of this grass is cured as hay and sold in Manila to livery stables. In Java the fresh grass is considered poor horse feed, except when young.

***Panicum reptans* L.**

Not uncommon and often abundant in cultivated soil. A good pasture grass.

***Panicum stagninum* Retz.**

An aquatic grass occurring in great abundance on the marsh lands about Laguna de Bay usually mixed with *P. paludosum* Roxb. and *P. amplexicaule* Rudge. Much of this grass is cut and sold green in Manila under the name *barili*. Both carabaos and horses eat it readily.

Paspalum conjugatum Berg. Carabao grass.

The most abundant shade grass in the Philippines, occurring especially in cultivated ground like abacá plantations. It is also common in low ground, often forming pure growths. Cattle and carabaos eat this grass but horses do not seem fond of it. This grass is native in tropical America and Merrill considers it introduced in the Philippines.

Paspalum longifolium Roxb. and *P. scrobiculatum* L.

These two species are closely similar in habit and botanical characters. They grow in bunches about 1 meter high, sometimes, especially in low ground, forming pure growths. From the experience in other countries they do not seem to be of much value as fodder.

Pennisetum macrostachyum Trin.

A coarse grass with handsome silvery spikes, but of no forage value.

Polytrias amaurea (Buse) Kuntze.

A low turf-forming grass with purplish foliage. Occurs about Manila where it is aggressive enough to overcome Bermuda and Korea grass in lawns. In Java it is considered a good pasture grass.

Rottboellia exaltata L.

A coarse grass not uncommon in good soil, where it grows to a height of 2 meters.

Mr. H. J. Gallagher, superintendent La Granja Modelo, Negros Occidental, states that horses eat it more eagerly than any other native grass, especially before it heads. At Bais, Negros, it is the principal grass cut for horse feed.

Rottboellia ophiuroides Benth.

Very similar to the preceding, but less common.

Saccharum spontaneum L. Tagalog, *talakib*.

A very coarse fibrous grass commonly reaching a height of 2 to 3 meters, abundant throughout the Islands. Carabaos eat it when very young only. Under heavy pasturing it gradually gives way perhaps due in part to trampling, but it can be eradicated only by digging up the roots. It possesses practically no value as forage.

Setaria flava (Nees) Kunth. Foxtail millet.

Common in waste grounds and cultivated fields, readily grazed before heading.

Sporobolus indicus (L.) R. Br.

A slender weedy grass of frequent occurrence, but of very little forage value.

Themeda gigantea (Cav.) Hack.

A tall coarse grass of no forage value.

Themeda triandra Forsk.

An abundant grass on the highlands of Benguet and not frequent at low altitudes. Cattle eat the young blades readily, and the fully grown grass is sometimes cut for feed, but is of poor quality.

Thuarea involuta (Forst.) R. Br.

A creeping seashore grass, abundant on the coast near Davao, and apparently furnishing good pasturage.

Zoisa pungens Willd. Korean lawn grass.

A common turf grass native to the Philippines near the seashore, especially in the more sandy soils. At the present time it forms 90 per cent of the turf on the Luneta at Manila, apparently being able to crowd out Bermuda. It is also a common constituent of all flat meadows near the seacoast. Not much is known of its value as a pasture grass.

Alysicarpus vaginalis (L.) DC. Tagalog, *manimanihan*.

Probably the best forage legume in the Philippines. *Manimanihan* is often abundant in low grounds sometimes making up nearly half of the pasturage. It is kept closely cropped by all grazing animals. Two other nearly related species are less frequent but of similar value.

Desmodium capitatum DC.

Not uncommon in low ground but cattle rarely eat it.

Desmodium procumbens (Swartz) Hitchc.

Often abundant and readily eaten by cattle. Introduced from America.

Desmodium triflorum. (L.) DC.

A very low plant forming a dense low turf even in Bermuda or Korean grass lawns. It is common throughout the Islands and when tall enough cattle eat it readily. The plant seldom grows above 2 inches in height.

Mimosa pudica L. Sensitive plant.

Abundant and very weedy in habit, rarely eaten by grazing animals except goats. Prof. E. B. Copeland, however, holds it

in high regard and states that all the live stock of the Agricultural College, Los Baños, thrive upon it. It may be like some other grazing plants in that stock must first acquire a taste for it before they will eat it freely.

Vigna lutea Gray.

Not uncommon on and near the sea beach, closely related to the cultivated cowpea and probably of similar forage value.

SUMMARY.

1. The natural pasture lands in the Philippines are enormous in area and capable of supporting many millions of cattle and carabaos.

2. These pastures improve under heavy grazing especially where the spread of finer grasses like Bermuda is encouraged. Other pasture grasses should be introduced with the view of still further improving these pastures.

3. For finishing feeds for beef cattle and hogs there is a large variety of easily grown forages available. These include corn, sorghum, teosinte, Japanese sugar cane, sweet potatoes, cassava, yams, chufas, peanuts, beggarweed, cowpeas, velvet beans, and soybeans. Other forages not yet introduced which should be fully tested are Guinea corn and other grain sorghums, moth bean (*Phaseolus aconitifolius*), kulthi (*Dolichos biflorus*), guar (*Cyamopsis psoraliodes*), adzuki bean (*Phaseolus angularis*), and rag millet (*Eleusine coracana*).

4. Hay for American and other horses can be cured during the dry season in Luzon, November to May, and probably in other islands.

5. Rhodes grass under irrigation can be cut three times during the dry season if planted about November 1. Everything considered this is the best known grass for the Philippines.

6. Other grasses of promise for hay are Tunis grass, Natal grass, and Sudan grass. The last named usually grows too coarse to cure easily.

7. Italian rye grass has given more promising results in the high mountain region than any other. It should be tested further as a hay grass.

8. For green forage several coarser grasses do well and are valuable. These include Guinea, Pará, and molasses grasses.

9. Grains that can replace oats in part are palay (unhulled rice) and maize. Mayuen (*Coix lachryma-jobi* var. *mayuen*) is also worthy of careful trial and perhaps also Guinea corn, a variety of sorghum. It also seems feasible to grow the seed of various beans for horse feed, especially horse gram (*Dolichos biflorus*), at present not grown in the Islands.

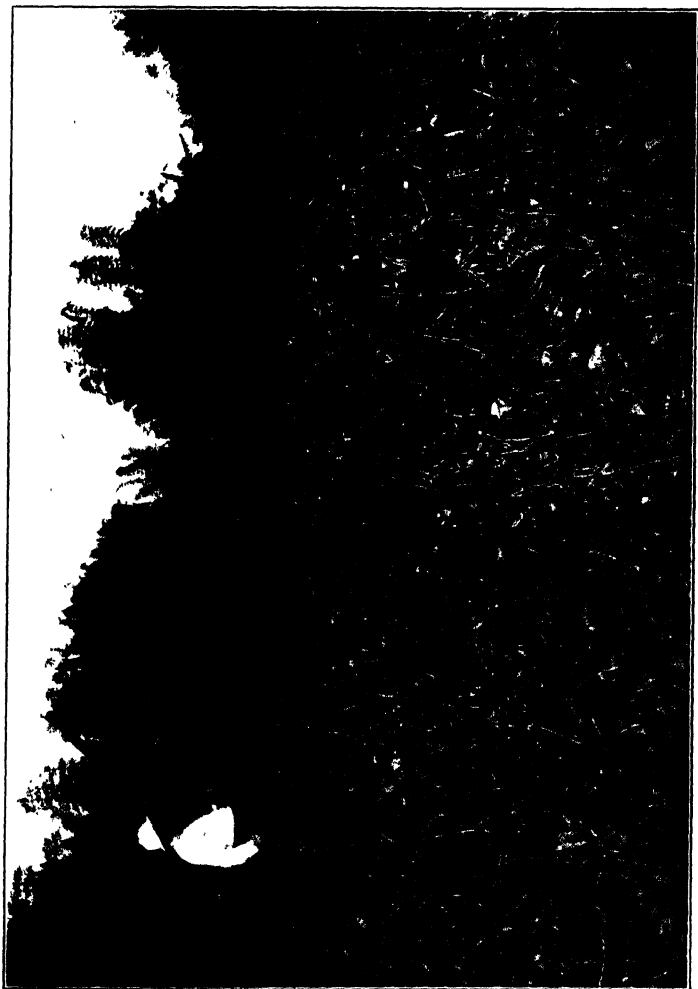


PLATE IV.—COWPEAS, LANAO EXPERIMENT STATION.

EXTRACTS FROM REPORT OF THE PROCEEDINGS OF
A BOARD OF OFFICERS OF THE CIVIL GOVERN-
MENT OF THE PHILIPPINE ISLANDS AND
OF THE UNITED STATES ARMY, AP-
POINTED BY THE SECRETARY
OF WAR.

ORDER CONVENING THE BOARD.

WAR DEPARTMENT,

Manila, P. I., September 1, 1910.

A board composed of the following officers of the Civil Government of the Philippine Islands and of the United States Army:

- (1) Vice-Governor Newton W. Gilbert, president,
- (2) Dr. G. E. Nesom, Director of Agriculture,
- (3) Col. Frederick G. Hodgson, assistant quartermaster-general,
- (4) Lieut. Col. David L. Brainard, department commissary-general,
- (5) Maj. Charles R. Krauthoff, commissary,
- (6) Capt. William R. Smedberg, jr., Fourteenth Cavalry,
- (7) Capt. Joseph L. Knowlton, quartermaster,
- (8) Capt. John E. Stephens, Second Field Artillery,
- (9) Capt. John J. Boniface, Second Cavalry,

is hereby appointed to meet in Manila, at the call of the president, to investigate and report upon the present cost of forage for use of the Army in the Philippine Islands.

The board, after careful and exhaustive consideration, will report whether native forage can be substituted for that now used, and if so, to what extent; the advisability of using, in part, native grasses grown in the vicinity of the various posts, with a view to reducing transportation; the relative cost of the two, and what methods, if any, should be adopted for procuring native forage, and, if deemed necessary, the board will conduct experiments for the purpose of ascertaining the utility and cost of production of native forage.

The board will also consider the question of using, wholly or in part, *native beef*, for the supply of the Army in the Philippine Islands.

The Civil Governor and the Commanding General, Philippines Division, will extend to the board every proper and possible aid and facility to carry on its work.

The junior member will record the proceedings of the board, and separate reports as to forage and use of native beef will be rendered, through the Commanding General, Philippines Division, to the Adjutant-General of the Army, at the earliest practicable time consistent with thoroughness.

Such journeys within the Philippine Archipelago as the members of the board may deem essential to its work are, so far as they relate to the military members, necessary in the military service.

The Civil Government will bear cost of experiments and the travel expenses of its members, under the laws and regulations governing in such cases.

(Signed) J. M. DICKINSON,
Secretary of War.

FIRST MEETING OF BOARD.

MANILA, P. I., *September 5, 1910.*

The board met, pursuant to the above order, at 3 p. m., September 5, 1910, in Manila, P. I.

Present: All the members, except Capt. John J. Boniface, Second Cavalry, junior member and recorder, who was then en route from his station, Jolo, P. I., to Manila, in compliance with the order.

The board then proceeded to a full and careful consideration of the order convening the board, and decided to appoint two committees, one to ascertain certain facts regarding forage, and the other certain facts regarding native beef. These committees were composed as follows:

(1) *Committee on forage.*—Dr. G. E. Nesom, Director of Agriculture; Col. F. G. Hodgson, assistant quartermaster-general; Capt. Joseph L. Knowlton, quartermaster.

(2) *Committee on beef.*—Dr. G. E. Nesom, Director of Agriculture; Lieut. Col. David L. Brainard, department commissary-general; Maj. C. R. Krauthoff, commissary.

The board then adjourned, at 5 o'clock p. m., to meet at the call of the president.

(Signed) NEWTON W. GILBERT,
Vice-Governor, Philippine Islands, President.

(Signed) JOHN E. STEPHENS,
*Captain, Second Field Artillery,
Acting Recorder.*

INSTRUCTIONS TO THE RECORDER.

MANILA, P. I., *October 25, 1910.*

Capt. John J. Boniface, Second Cavalry, junior member and recorder of the board, arrived in Manila September 14, 1910, and reported to the president of the board, and was directed by him to report to Colonel Hodgson and assist in procuring the following information for the forage committee:

1. To ascertain the amounts of forage imported into the Philippine Islands by the principal importers of Manila during the past year.

2. Varieties of same, and quantities of each.

3. Cost of same, in detail.

4. The countries from which such imports came, and quantities from each, in detail.

5. What kinds of forage were being used by civil stables in Manila.

6. Quantities of each, how fed, and cost, in detail.

7. What kinds of forage were being fed by the various departments of the United States Government.

8. Quantities of each, how fed, and cost, in detail.

9. To investigate native grasses and grains.

10. To investigate such mixed and crushed feeds as were being used in the Philippine Islands.

11. To submit detailed report as soon as possible, with recommendations.

In compliance with the above instructions, Captain Boniface at once reported to Colonel Hodgson, who instructed him to make the necessary investigations. Therefore, the following report is herewith submitted. All money mentioned is American money, and all tons are ordinary tons of 2,000 pounds unless otherwise stated, and the hundredweights referred to are hundredweights of one hundred pounds. It appears that some dealers use the ordinary ton and hundredweight, while others use either the metric ton or the long ton of 2,240 pounds.

RECORDER'S REPORT.

In consulting the various dealers and others, it has been difficult to secure exact prices from many of them; the prices quoted herein are believed to be as nearly correct as careful inquiry at the present time can determine. The prices from the dealers are probably somewhat different from the prices those firms would quote were they submitting bids to the Government for

large quantities. The prices represent, as nearly as may be, the *cost* of the various hays and feeds in storehouse in Manila, ready for sale.

Before submitting Table 1, it has been deemed essential to the board to have samples present of all the various feeds now being used in the Philippines, for comparison and information, and the samples considered are itemized in the following list, which also gives the firm furnishing the sample and the cost per 100 pounds in storehouse in Manila, ready for sale, to which price the firms would, of course, add their profit before sale:

VARIOUS FEEDS IN THE PHILIPPINE ISLANDS.

No.	Sample	Firm	Cost per one hundred pounds.
1	Crushed feed	Castle Bros. Wolf & Sons	\$1.80
2	do	Forage Factory	1.59
3	do	Macondray & Co.	1.85
4	do	Stevenson & Co.	1.79
5	do	Quartermaster-general	1.025
6	American oats	Quartermasters department	1.70
7	New Zealand oats, "A" grade	Macondray & Co.	1.90
8	Australian oats, Algerian No. 1	do	1.63
9	New Zealand oats, "Gartoms"	do	1.96
10	Australian oats, "Storm Kings"	do	2.05
11	Australian oats, No. 1	Castle Bros. Wolf & Sons	1.79
12	American bran	Quartermasters department	1.54
13	Australian bran	Castle Bros. Wolf & Sons	1.49
14	Japanese bran	do	.994
15	Australian bran	Macondray & Co.	1.04
16	American timothy hay	Quartermasters department	1.276
17	American oat hay	do	1.045
18	American Kansas prairie hay	do	.774
19	Australian oat hay	McKay & Zoellers	1.875
20	Australian alfalfa hay	Macondray & Co.	1.12
21	Mani-mani grass	Leandro Reyes	1.86
22	Barit hay, Bifiang	do	.68
23	Barill hay, Bifiang	do	.70
24	Guinea grass	Alabang farm	.273
25	Native zacate	Hashim, Government contract	.894
26	Palay, Pangasinan	Bureau of Agriculture	1.364
27	Palay, Zambales	do	1.364
28	Native corn	Forage Factory	1.28
29	Manchurian bean	do	1.30
30	Australian compressed fodder	Castle Bros. Wolf & Sons	1.05
31	do	Macondray	.941
32	Philippine stover	Forage Factory	.804

FORAGE IMPORTED INTO THE PHILIPPINES.

TABLE 1.—Covering subjects 1, 2, 3, and 4. Forage imported into the Philippine Islands during the past year, and native forage used therein, by whom, from where and detailed cost of same.

[The hundredweight equals 100 pounds and all prices are in American money.]

No.	Variety	Quartermasters department		Insular Purchasing Agent		Castle Bros. Wolf & Sons.		Macondray & Co.	
		Pounds brought in	Cost per hundred-weight	Pounds brought in	Cost per hundred-weight	Pounds brought in	Cost per hundred-weight	Pounds brought in.	Cost per hundred-weight
1	American oats	24,198,342	\$1.70	3,836,039	\$2.07	1,202,250	\$2.03		
2	American bran	15,174	1.54						
3	American timothy hay	26,210,752	1.276	6,331,668	1.768	1,680,750	2.03	187,000	\$1.79
4	American oat hay	498,830	1.045			560,250	1.37		
5	Australian oats			320,600	1.79	320,600	1.79	1,365,175	1.79
6	Australian bran			86,763	1.48	720,000	1.49	545,920	1.79
7	Crushed feed, quartermaster general.	8,000	1.025						
8	Australian alfalfa							35,700	1.12
9	Australian compressed fodder.			22,565	1.63	3,193,875	1.05	4,057,110	1.06
10	Japanese bran			80,000	1.23	600,000	.994		
11	Forage factory crushed feed.	88,160	1.59	8,800	1.59				
12	New Zealand oats					80,150	2.07		
13	Zacate, native	16,801,500	.394						
14	Australian crushed feed.			93,104	2.00	2,000,000	1.80	2,027,600	1.85
15	Manchurian bean			167,545	1.30				
16	Corn, native			981,847	1.28				
17	American Kansas prairie hay	3,166,443	.774						
		Stevenson & Co.		McKay & Zoellers		Banyea & Co.		Alabang farm station.	
3	American timothy hay.	8,800,000	1.92						
6	Australian bran	800,000	1.71	141,000	1.75				
9	Australian compressed fodder.	2,000,000	.933	660,000	.83				
12	New Zealand oats	1,500,000	1.71						
14	Australian crushed feed	1,750,000	1.79						
8	Australian alfalfa			10,000	1.875	25,000	1.13		
18	Australian oat hay			600,000	1.875				
5	Australian oats			400,000	2.00				
19	Guinea grass, Philippine Islands							4,000,000	0.273

NOTE.—The "Australian crushed feed" of Castle Bros. Wolf & Sons is mixed, ground, and sacked in Manila, at their mill. The rest comes already sacked from Australia.

DAILY FEEDS IN PRIVATE STABLES.

TABLE 2.—*Covering subjects 5 and 6. Forage fed daily in private stables (livery and others), in Manila, with amounts and detailed cost of same, per horse.*

[Cost in United States currency.]

No.	Stable investigated and daily feed components.	Amount of each, in pounds.	Cost of each per pound.	Daily cost of each component	Daily cost for one horse.	Number of horses fed	Total daily cost of feeding	Remarks.
1	Australian Horse Bazaar:							
	Australian oats	1.5	0.02	0.03	0.279	40	11.16	{ Sales stable, little work, zacate occasionally as laxative. Three daily feeds.
	Australian bran	2.25	.02	.045				
	Australian compressed fodder.	19.2	.0106	.204				
	Zacate		.0025					
2	Star Livery Stables:							
	Australian oats	8	.02	.16	.34	200	68.00	{ Horses work hard; continuous feeding; trying Bilhang hay.
	Australian bran	4	.015	.06				
	Australian compressed fodder.	12	.01	.12				
3	N. & B Stables:							
	Australian oats	7.0	.0195	.137	.333	80	26.64	{ Horses work hard; three feeds per day
	Australian bran	2.6	.019	.05				
	Australian compressed fodder.	8.37	.0095	.08				
	American timothy hay.	3.28	.02	.066				
4	Rosenberg Stables:							
	Australian oats	7.17	.02	.143	.315	16	14.49	{ Horses work hard; three daily feeds.
	Australian bran	3.48	.02	.07				
	Australian compressed fodder.	9.24	.011	.102				
5	Macondray Stables							
	Australian oats	7.25	.018	.131	.292	42	12.26	{ Horses are draft, three daily feeds
	Australian bran	2.6	.018	.047				
	Australian compressed fodder.	12.0	.0095	.114				

DAILY FEEDS IN GOVERNMENT STABLES.

TABLE 3.—*Covering subjects 7 and 8. Forage fed by the various departments of the United States Government, daily, per horse, with amounts and detailed cost of same, in the Philippine Islands.*

No	Stable investigated and daily feed.	Amount of each, pounds.	Cost of each pound.	Daily cost of each component.	Daily cost for one horse.	Number of horses.	Total daily cost.	Remarks.
1	City stable No. 1.							
	American oats	14.0	0.0225	0.315	0.665	68	45.22	{ American and Australian draft horses. Guinea grass cut in cemetery and fed one week per month.
	American timothy hay.	17.0	.0206	.350				
	Guinea grass							
2	City stable No. 2:							
	American oats	14.0	.0225	.315	.665	42	27.98	{ Do.
	American timothy hay.	17.0	.0206	.350				
	Guinea grass							
3	Alabang farm:							
	Forage factory crushed feed.	6.0	.0159	.0954	.1554	50	7.77	{ Draft and riding horses; grow the grass.
	Guinea grass	22.0	.0027	.06				

TABLE 3.—Covering subjects 7 and 8. *Forage fed, etc.*—Continued.

No.	Stable investigated and daily feed	Amount of each, pounds.	Cost of each pound.	Daily cost of each component.	Daily cost for one horse.	Number of horses	Total daily cost.	Remarks.
4	Land transport corral:							
	(a) American oats	12.0	.0169	.2024	.3816	419	159.89	{ Drait and riding horses.
	American timothy hay	14.0	.0128	.1792				
	(b) American oats	9.0	.0169	.1518	.3181	419	133.28	{ Ration fed at present.
	Zacate, Philippine Islands	11.0	.00425	.0468				
	American timothy hay	9.33	.0128	.1195	.3700	419	155.03	{ If used instead of the regulation ration
	(c) Forage factory crushed feed	12.0	.0159	.1908				
	American timothy hay	14.0	.0128	.1792	.2875	419	120.16	{ Being tried on eight animals
	(d) Forage factory crushed feed	9.0	.0159	.1431				
	Zacate, Philippine Islands	11.0	.00425	.0468	.2621	419	109.82	{ Ration now being started
	American oat hay	9.33	.01045	.09763				
	(e) Forage factory crushed feed	9.0	.0159	.1431				
5	Zacate, Philippine Islands	11.0	.00425	.0468				
	American Kansas prairie hay	9.33	.00774	.0722				
	Cavalry posts							
	American oats	9.0	.0169	.1518	.2708	5,000	1,354.00	{ Present feed in most posts
6	Zacate, Philippine Islands	11.0	.00425	.0468				
	Kansas prairie hay	9.33	.00774	.0722				
	Manila fire department							
	American oats	7.92	.0207	.1639	.4062	59	23.97	{ Present feed
	American timothy hay	11.88	.01768	.21				
	Australian compressed fodder	1.98	.0163	.0323				

NATIVE GRASSES.

(Covering subject 9)

From the preceding tables in this report, it is shown that horses in these Islands are now being fed various kinds of hays and grasses—roughage—daily; a detailed investigation produces the following information:

(1) *The Army.*—The Army brought in from the United States during the past fiscal year 26,709,582 pounds of hay, costing \$340,814.27 gold, delivered in Manila. There is a charge of 15 cents gold per hundred pounds included in this amount, this being the charge for transportation from the United States to Manila.

At the commencement of the fiscal year the Army fed American timothy hay, costing \$1.276 gold per hundred pounds, delivered in Manila.

Later, as a matter of economy, shipments of American oat hay were received, commonly known as California "Atlas" hay, and costing \$1.045 gold per hundred pounds, delivered in Manila.

Still later, to further reduce expense, shipments of American Kansas prairie hay were received, costing only \$0.774 gold per hundred pounds, delivered in Manila. This hay is now being fed, at a saving over the original timothy hay of \$0.502 gold per hundred pounds, or \$10.04 gold per ton of 2,000 pounds. As the Army brought in 13,355 tons of hay from the United States during the past year, it can be seen that a saving of \$10.04 gold per ton represents an annual saving of \$134,084.20 by using this Kansas prairie hay instead of the timothy hay.

No deterioration in the condition of the Army animals has been noticed as a result of the change from the timothy hay to the American oat hay; nor has the capacity of our animals for work decreased. The change to the Kansas prairie hay has only just commenced, 3,166,443 pounds having recently been received and distributed to twenty-eight posts throughout the Archipelago.

* * * * *

It is hoped and believed that the reports on this hay will be favorable and that shipments of this hay may be continued; it is too early to state the result obtained in feeding this hay, or to compare results at the various posts with the previous timothy or oat hay; therefore a report in detail will be submitted at a later time. The saving in substituting this hay for the timothy and even for the oat hay has already been pointed out above. This Kansas prairie hay appears very dry, as though baled since last spring, but it has a sweet healthy odor, and those horses so far observed eat it readily, though they are found to leave some of it in their mangers, thus causing wastage. However, after the horses have been kept on it to the exclusion of other hays for a time, it is believed this left-over portion will be eaten. This hay is now being tested by the Bureau of Agriculture, for the board, and the next report will contain a detailed consideration of the results found, and the grass compared by table with the other hays and grasses. Should this hay prove satisfactory, it appears to be the best cheap hay put up in the United States which can be shipped to the Army in these Islands, and until native hays and grasses are found sufficient in quantity and nutritive qualities it is doubtful if a more economical hay can be found outside of the Archipelago. A determined effort on the part of the Government will have to be kept up in feeding this hay, for those accustomed to being furnished timothy hay will not be very favorably impressed with this prairie hay, and not realizing the importance of economy in foraging a large number of animals thousands of miles from their native country, may submit reports more or less adverse; this being so, it is

believed that a member of this board should visit these posts, explain the need of economy and careful feeding with this hay, and enlist the coöperation of all concerned, and observe at first hand how it is being fed and condition of animals, methods of storing, etc., and submit to the board a full report at a later date.

To still further reduce forage expense, the Army has contracted for and is using native zacate; this is costing an average of \$0.394 per hundred pounds, delivered at the various posts.

* * * * *

When feeding this zacate, Table 3 shows that 11 pounds of this green grass is used in lieu of $4\frac{1}{2}$ pounds of the American hay. Again, referring to Table 3, it is seen that this use of native zacate nets a saving to the Government, fed as explained—11 pounds of zacate, Hashim contract, \$0.425, against $4\frac{1}{2}$ pounds of American timothy hay, Government contract, \$1.276—of \$0.013 gold per horse per day. With approximately five thousand horses in the Army in the Philippines, this means a daily saving of \$65 gold or \$23,725 gold per annum.

* * * * *

The problem now before the Army, so far as the hay portion of the ration is concerned, is, can it be reduced or changed to a cheaper kind and still maintain our \$2,000,000 worth of horses and mules in first-class condition. Also, to reduce shipments to a minimum, save in handling, time, and cost, and utilize native products so far as possible.

In order to consider this question, it is believed that a brief statement regarding each hay and grass now used here will be of advantage to the further work of the board, and therefore this is given herewith:

(1) *American timothy hay*.—This has been found excellent in every respect, but very expensive, comparatively, and not to be brought in if anything else can be substituted.

(2) *American oat hay*.—This is regarded as excellent, is much less expensive than timothy, and is now being fed in various posts. No adverse reports have been received thus far, and the many officers with whom the recorder of this board has talked are all in favor of this hay, finding that their troop horses do very well on it. The recorder has personally fed this hay to the horses of his troop for some months, with entirely satisfactory results.

(3) *American Kansas prairie hay*.—This is being fed as reported above, and later report will have to be made after more time has passed. It is very cheap and, although not seeming

to contain as much blue stem grass as most of the Kansas' prairie hays have, is good hay.

(4) *Zacate, native*.—This is being fed as already reported above. The Army is the only large organization that is actually using the zacate as part of the regular daily ration. In some livery stables here it is fed occasionally, as a laxative, and in addition to the regular feed—not as a substitute for any portion of the daily ration. The following opinions of men handling horses have been obtained:

TABLE 6.

No.	Stable.	Opinion
1	Corral master, land transport corral.	Small benefit to horse, too much water, horses could not do hard work unless given some hay also; acts a little as laxative, but has had no animal exhibit any unfavorable symptoms.
2	City stables	Never used enough to make a thorough test, but regard it as unfavorable because of little value except as laxative.
3	Alabang farm	Fed as a portion of the daily roughage. It ought to be beneficial to horses, as it is slightly laxative and takes the place of some of the hay, but it is not fed to the horses on the farm.
4	Australian Horse Bazaar	A small amount is given each horse, almost daily, as laxative; does not think horses would keep upon it in place of hay. Has never so used it.
5	Star Livery Stable	Uses none; tried for a short time, feeding a small amount and increasing it, stopped because the horses did not appear to eat it and did not think they looked as well as when eating their usual feed of mixed oats, bran, and fodder.
6	N. & B. Stable	Tried it several months as laxative in lieu of bran; unsatisfactory and so went back to bran.
7	Rosenberg Stable	Tried for a short time, but delivery was very uncertain and horses did not appear as well, but they ate it all up.
8	Macondray & Co. Stable	Tried it a short time, but stopped because it had no substance and was all water.

These opinions all sound strange to those officers who were in the early Philippine campaigns; during the years 1899, 1900, and the early part of 1901 many cavalry officers fed the horses of their troops with palay and zacate, having nothing else; the zacate was brought to their stables daily, freshly cut, and fed the same day and the next morning; the horses did full field work on this ration, harder work than any cavalry troop has been doing in these Islands since, and it would seem strange if this zacate can not now be fed far more than it is. It is recommended that a test be made of feeding the zacate in place of the hay, and the result reported. The more this zacate can replace American hay the greater will be the saving. The Kansas prairie hay costs here in Manila \$0.774 gold per hundred pounds, while the zacate can be had for an average contract price of \$0.394 gold per hundred pounds and all transportation is eliminated. If to substitute 14 pounds of zacate for the same regulation allowance of American hay is found to be too little for the horses, the zacate can be increased considerably

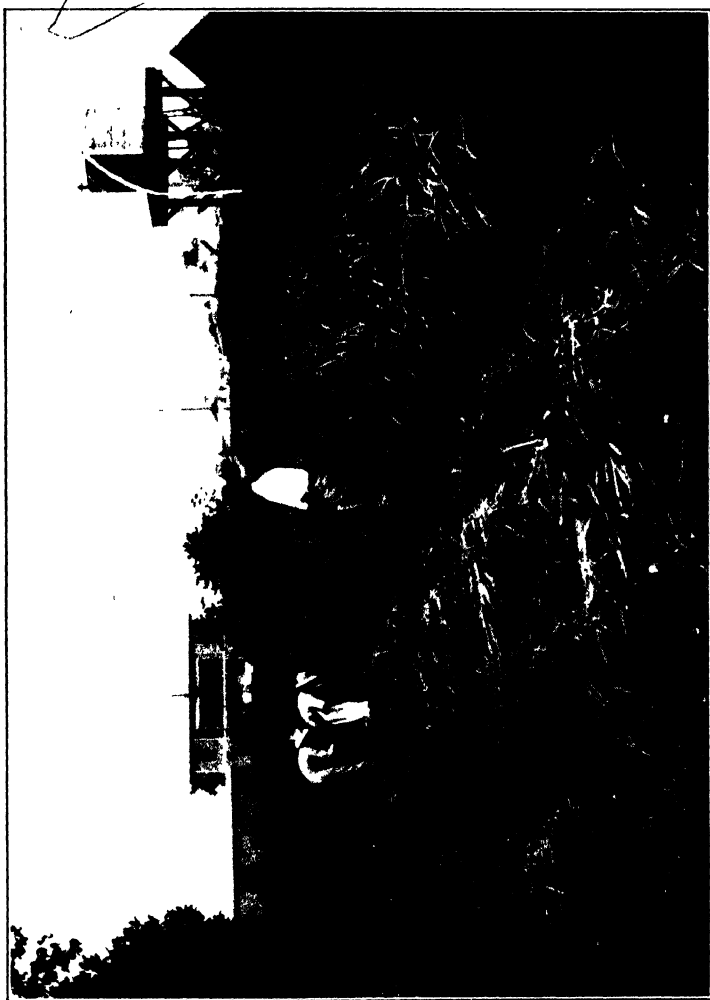


PLATE V.—GUINEA GRASS, SINGALONG EXPERIMENT STATION.

and the saving still be large in money. In various quarters there seems still to dwell the fear that horses contract surra by eating zacate and grazing on inundated lands here; this fear is entirely groundless, as has been definitely shown by the United States Department of Agriculture, in its report on that disease, Bulletin No. 42, 1902, the fly theory being the one now regarded in the "Emergency Report on Surra" as the correct one. Little or no surra exists among the Army animals to-day, yet practically every garrison grazes its horses daily and uses much zacate.

(5) *Guinea grass*.—This grass is being grown on about one acre at Jolo, P. I., and fed to the mules at that post; they eat it all up and appear to thrive on it.

It is also raised at the Alabang experimental farm, where about 20 acres are now under cultivation. This grass is averaging about 110 short tons per year per acre, and is cut eleven times a year; it grows to a height of 6 feet or more, but can be cut long before that, of course; it grows very rapidly and is known as a good roughage for horses; this is demonstrated at the Alabang farm, where the work and saddle horses get no hay at all, they are fed the Forage Factory crushed feed in place of oats and Guinea grass in place of hay, and an inspection of the animals shows their condition to be excellent.

The authorities at the Alabang farm regard this Guinea grass as a most desirable grass and feed it freshly cut. The selling price to the Government, at this station, is \$0.273 gold per hundred pounds. The ground on which the grass is being raised is regarded as below the average, needing both fertilizing and irrigating, but the growing is carefully attended to; so far as its being grown by the native farming population is concerned, the results, even after some instruction, would not, of course, run much beyond 60 or 70 short tons per acre until its growing was very well understood; later much larger crops might confidently be expected; were this grass grown in the vicinity of our posts here, the native knowing there was a steady market for it, it is believed that it could and would take the place of American hay, especially if it is found later on that the zacate referred to above will not do as a permanent substitute for American hay.

(6) *Mani-mani-an grass*.—This is a well-known native grass and is fed green; the sample submitted was secured at the Alabang farm. In Batangas it is largely fed to the native ponies and has been tried with satisfactory results on some American

horses in times past. A further investigation of this grass will be made, if the board desires.

(7) *Cogon grass*.—This is a well-known general grass of the Philippines—wiry, tough, with sharp edges, horses will not eat it. Its only known use at present, so far as can be learned, is in thatching native house roofs; in the manufacture of paper it is being experimented with.

(8) *Australian grasses*.—It seems that no timothy hay is raised in Australia, although various unsuccessful attempts have been made to cultivate it.

Considerable alfalfa hay, however, is raised there, some small shipments having reached these Islands, as shown in Table 1. These shipments arrived as feed for cattle, to be fed en route here, were bought cheap by local dealers, and what is now here is being sold in small quantities at \$1.12 gold per hundred pounds. By cabling to Australia it has been learned that the present price laid down in Manila is \$1.12 gold per hundred pounds. It is regarded as being inferior to American oat hay or to the Kansas prairie hay, either of which costs less, as shown in Table 1. Local dealers state that they find it too heating and too laxative.

Australian oat hay is also raised in Australia, and Table 1 shows some 600,000 pounds came here during the past year, costing \$1.875 gold per hundred pounds in Manila. The present selling price is \$2 gold. Even if the Army could secure this hay at the price shown, that price is prohibitive, being \$0.83 gold more than the American oat hay and \$1.10 gold more than the Kansas hay.

(9) *Philippine corn-blade fodder*.—Taking the definition of "fodder" given by a well-known authority, it states that "Corn fodder, or fodder corn, consists of the stalks of corn, either green or dried, which are grown for forage and from which the ears or nubbins, if they carry any, have not been removed." This same authority (Henry) defines "stover" as "the dry stalks of corn, from which the ears have been removed." Neither of these definitions can therefore be used in defining the roughage which is here termed "corn-blade fodder" and by which is meant the *leaves* of the corn only. These leaves are stripped off from the stalk, cured and baled into bales weighing about 90 pounds. These roughage tests are nearly equal in nutritive properties to American timothy hay. The visible supply in these Islands at this moment consists of some thirty bales now on hand at the Forage Factory. General Malvar, a native contractor, states that he can supply 1,000 tons within the next six months. There is an enormous quantity of corn raised in the Philippines, and

there seems to be no reason why many native farmers can not put up this so-called "fodder" and, in fact, should this prove a satisfactory substitute for American hay, it is confidently believed that plenty of it, cured and baled, can be secured. It is believed that many bids will be received whenever the Government calls for them, and that the contract prices quoted the Government, for large quantities, will prove to be far less than the prices now paid for any American hays. This being so there is no reason why the supply of this so-called "stover" could not be made to increase many times in quantity within another year, if the farming population are taught that there will be a market for it. In some parts of the United States ordinary "stover" is fed as roughage, and some feeding is also done of the leaves, with satisfactory results. The following quotation, from the authoritative treatise, Henry's "Feeds and Feeding," is submitted as bearing directly upon this form of roughage:

Fodder corn, grown so thickly as to permit of only small "nubbins" forming, and cured in the shock into a bright, dust-free forage, is one of the best articles available for roughage in horse feeding. While the stalk and husk will be left uneaten, the leaves disappear with a relish when offered to horses under any conditions. Not only are corn leaves usually quite free from dust but they are palatable and full of nutriment, and will be found an economical substitute for timothy hay. When the tonnage of a field of fodder corn is compared with the yield of timothy hay from a like area, it is apparent that the forage of the corn plant should hold a prominent place with horsemen who seek economy while at the same time wishing to supply a palatable and nutritious roughage.

At present it is estimated that the Philippine "stover" can be purchased for about \$18 gold per long ton, or \$0.804 gold per hundred pounds. Once the native farming population here know this will be purchased by the Government, the competition will cause some reduction in this price, especially in large quantities, and it should cost no more than the present Kansas prairie hay, \$.774 gold; and all transportation would be saved, as the contract conditions usually call for delivery at the posts to be supplied.

It is desired, if agreeable to the board, to utilize the thirty bales of this "stover" now on hand at the Forage Factory in making a test on several horses, feeding them no other hay, and using this forage of the corn leaves in the same amount—by weight as with other hay—and submit report later.

(10) *Biñang hay*.—This is the first successful effort that has come to the attention of this board of the curing and baling of a native grass by a native of the Philippine Islands. The

hay itself is a native zacate, and is now being analyzed at the Bureau of Agriculture and report will be made later. One livery stable in Manila, the "Star," is now using some of this hay. When the manager of this stable was asked about a month ago how the horses liked this hay, he stated that they did not care for it, but as the regulation daily ration in that stable was being fed, this was not surprising. About a week ago a second inquiry was made and it was found that the horses were now eating it with good results. A sample is before the board, known as "barit" hay. This has been cured and baled by a native farmer named Leandro Reyes, in Biñang. He states that he has no more of this hay, but is now raising a grass known as "barili," and is curing and baling it satisfactorily. However, he is ready to raise, cure, and bale either kind. He states that the "barili" hay is running about 25 metric tons per acre per year, and that he makes six cuttings per year. He states that he can furnish, cured and baled and aboard cars at place of cutting, 2,200,000 pounds within the next six months, at \$0.70 gold per hundred pounds. This is \$0.074 gold cheaper than the Army is now paying for the American Kansas prairie hay, which price is \$0.774 gold. This farmer has land in Biñang, Calamba, Los Baños, and is prepared to secure more if he finds there is a market for his hay. It is probable, also, that were large quantities advertised for by the Army, a lower price would be secured.

In the cultivation of this hay the owner does not irrigate, but he does fertilize, using guano. He cuts this hay from January to May.

This man is also now raising Guinea grass, and is selling it to the Alabang farm at \$7.50 gold per metric ton, and offers it to the Army, in large quantities, on cars at Biñang, at \$0.319 gold per hundred pounds. He is also raising about 500,000 kilos of the mani-mani-an grass, and states that he has been offered by the Bureau of Agriculture \$1.36 gold per hundred pounds on a delivery of 1,000,000 pounds. This, of course, would be a prohibitive price so far as the Army is concerned, as our American timothy hay costs but \$1.276 delivered here in Manila.

Comparing the "barit" hay with the "barili" hay, it is understood that the "barili" hay is better; the cost of the "barit" hay is somewhat less.

(11) *Australian compressed fodder*.—This, of which very large amounts are used in the Philippines, by private stables, as shown in Tables 1 and 2 of this report, appears to be composed of wheat straw and oat straw, chopped up and baled into bales

averaging about 85 pounds per bale. The prices are given in the two tables referred to. There are several grades, indicated by the prices. The grade sold by Messrs. Macondray & Co. seems to contain more oat heads (grains) than any of the others inspected. This compressed fodder is fed daily in practically every private stable (livery, etc.) in Manila, generally taking the place of hay. The method of feeding it, as shown in Table 2, consists in mixing it with the oats and bran, making one forage ration entire.

So far as can be learned, this compressed fodder has not been fed in any of the Government stables, civil or military, except in the stables of the Manila fire department. Table 3 shows how much is fed in that department daily, per horse; it is mixed with the oats, and appears to take the place of bran, none of the latter feed being used and no green forage being fed.

Considering Table 1, it will be seen that no advantage will accrue to the Government by substituting this Australian compressed fodder for either American oat hay or American Kansas prairie hay, either one of these two latter hays costing less, delivered in Manila, than the compressed fodder.

The above hays and grasses are all that have been investigated, so far, by the board; in view of the experience of some cavalry officers here in feeding the well-known Johnson grass, in Cuba, during the occupation of that island, it might be added that this grass is not grown in the Philippine Islands and has been regarded by the Bureau of Agriculture as rather undesirable, because this grass once planted is extremely tenacious, and once fully spread over various parts of the Islands is almost impossible of elimination, if found unsuited for the forage purposes in the soils found here.

CRUSHED FEEDS.

(Covering subject 10.)

With a view to substituting something cheaper for the oats used by the Army and others in civil life here, several crushed feeds are now being tried by both the Government authorities and private firms and stables.

The Army, during the past fiscal year, brought from the United States 24,108,342 pounds of oats, costing \$1.70 gold per hundred pounds, or a total expenditure of \$409,841.81 gold. The transportation charges on these oats, from the United States to these Islands, is 15 cents gold per hundred pounds, the same as on the hay.

The desire to secure a satisfactory substitute for these oats is based on the same reasons as apply to the desire to secure a

native hay—lower cost, less transportation and the utilization of the native products so far as possible.

Horses matured on oats show mettle which can not be reached by the use of any other feeding stuff; there is no grain so safe for horse feeding, the animals rarely being seriously injured if, by accident or otherwise, he gets an oversupply. This safety is due, in no small measure, to the presence of the oat hull, which causes a given weight of the oats to possess considerable volume, because of which there is less liability of mistake in measuring out the ration. Further, the digestive tract can not hold a quantity of oats sufficient to produce serious disorders. Very new oats should not, of course, be fed.

According to many and various experiments, made at widely separated points, by various well-known authorities on horse feeding, oats may, however, often be profitably replaced by other concentrated and easily digested feeding stuff. This is very important at times, on account of the high cost of the oats.

The crushed feeds now being tried in these Islands are, therefore, submitted in detail in the following table:

TABLE 7.—Crushed feeds now being tried in the Philippine Islands, by the Government and by private firms, with cost per 100 pounds.

No.	Kind.	Forage Factory	Castle Bros. Wolf & Sons.	Macon- dray & Co	Steven- son & Co.*	Quarter- master- general's depart- ment.
		<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>
1	Australian oats		45	40	Some.	
2	Australian bran	15	10	10	Some.	
3	Australian barley			20		
4	Australian corn			10	Some.	
5	Philippine Islands corn	62	14			
6	American barley		11			
7	Manchuria bean	23				
8	India pea		10			
9	Australian pea			20		
10	American alfalfa meal					50
11	American oats					50
12	Australian bean				Some.	
	Total	100	90	100		100
	One sack, cost per hundred pounds	\$1.59	\$1.80	\$1.85	\$1.79	\$1.36

* Composition of this crushed feed not known by Stevenson & Co.

TABLE 9.—Comparative cost of American oats and the various crushed and mixed feeds now being tried in the Philippine Islands.

No.	Kinds.	Quantity per year, pounds.	Cost per 100 pounds.	Annual cost
1	American oats	24, 108, 342	\$1.70	\$409,841.81
2	Forage Factory crushed feed	24, 108, 342	1.59	383,322.64
3	Castle Bros. Wolf & Sons crushed feed	24, 108, 342	1.80	433,952.16
4	Macondray & Co. crushed feed	24, 108, 342	1.85	446,004.48
5	Stevenson & Co. crushed feed	24, 108, 342	1.79	431,539.32
6	Quartermaster-general's mixed feed	24, 108, 342	1.36	327,873.45

Bran.—The Army brought in only the small quantity of 15,174 pounds of bran during the past fiscal year, at a price of \$1.54 gold as shown in Table 1. The samples before the board show that if any bran is required, there are two classes that can be purchased cheaper than the American and appearing equally good—the Australian bran of Macondray costs to-day but \$1.40 gold per hundred pounds and that from Japan, brought in by Castle Bros.-Wolf & Sons costs but \$0.994 gold per hundred pounds. In view of the grazing of our animals in most posts and the feeding of the green zacate in addition, little bran should be required, its principal feeding object being for laxative purposes.

Coconut meal.—The residue in the manufacture of coconut oil is known as coconut or cocon meal; it is used quite extensively by dairymen in the vicinity of San Francisco, and may be used with advantage for swine and sheep, serving also as a partial substitute for oats with horses. The French war department investigated the value of coconut meal for army horses. "The result proved that coconut meal was equal and even superior to the same weight of oats, and according to French prices of feeding stuffs, a substitution as in the above experiments would bring about a reduction in the cost of keeping army horses of about \$10 per head per year." This statement is taken from one of the best-known authorities on horse feeding.

In view of the enormous quantities of coconuts raised in the Philippines, it would seem that an experiment might be made here, but investigation locally develops the fact that no firm here is able to extract the oil from the coconut; two firms have tried it in the past and both stopped for various reasons. This meal appears to be used principally for fattening purposes and firms here that are familiar with the coconut business inform the board that the meal, even if procurable here, would not be fit for our horses in the Army that are doing regular and often hard work.

RECOMMENDATIONS.

(Covering subject 11.)

Summing up the various means given in this report looking toward further economy in foraging the Army animals, the following experimental rations are submitted and compared with those now being used; it is recommended that the board consider them and give such instructions to the recorder as are deemed proper, with a view to conducting such of the experiments as seem to point to economy and success. (See Table 10.)

* * * * *

The test rations are being gradually fed to the selected animals,

forty-eight in number—twenty-four horses and twenty-four mules, all draft. It is hoped that by February 1 all of these animals will be living entirely on the test rations. We began feeding all of the tests that did not include the palay on January 16 and having received the palay on January 20 the remaining tests containing the palay began January 20, 1911. The tests should be in full working order by February 1, and will then run two months, ending March 31, 1911.

The animals selected have been carefully examined by United States Veterinarian O'Connell, of the land transportation corral, and myself, to assure good condition of each and similarity of work. In order to make the test as successful as possible, the present components of the rations are being gradually reduced and the test components substituted, so that no sudden change will result which might spoil the tests.

* * * * *

The tests now running have not, therefore, progressed far enough to enable a report to be made on them, but yet certain temporary deductions may be made from our daily observation of the feedings:

First. The corn-blade fodder is being eaten so rapidly as to lead to the belief that it is palatable to the animals; it is known to be very nutritive, and this roughage may finally be found a satisfactory substitute for American hay. Then will come the work of interesting the natives in preparing and furnishing it in large quantities and at a low price; this will take several years, for at present no one of the native farmers has tried to cure and bale this fodder and they would have to be taught.

The fodder we bought for these tests was all there was on hand at the present time; it came from the Bureau of Agriculture, being cured and baled by that Bureau as an experiment. This Bureau will probably purchase more this season, and is encouraging the natives to understand curing and baling this fodder. One prominent native, Malvar, of Laguna Province, is going to put up some of these bales this season. The interest of the natives will increase very much once they know there is a large market for it; until then they will not go into this work to any large extent.

It is recommended that the Army arrange with the Bureau of Agriculture for the purchase of about 200,000 pounds of this corn-blade fodder this year, for it is believed that if we make an effort, through that Bureau, among the natives, to secure a

considerable amount now, as a start, the 200,000 pounds will have to be secured from various provinces and many growers, thus spreading the knowledge of the value of this feed among many farmers. It is hoped we can get the 200,000 pounds of this corn-blade fodder this season, for it is believed it will be eaten and prove a good feed; the order will at once cause various growers to put up the bales and thus encourage them by assuring them of a market, and once the 200,000 pounds are on hand it is recommended that it be issued to the post of Fort McKinley for issue in place of a like amount of American hay. The analysis of this fodder has shown that it is very nearly equal in nutritive value, to American timothy hay. Unless this recommendation is carried out within the next month or so, it is doubtful if the fodder can be obtained until next season. As our oat hay costs only \$1.045, all bids should be rejected if this fodder comes higher than say \$0.85 gold.

Second. The Kansas prairie hay is being eaten all up; so far, no deterioration in the condition of any animal has been observed either at the land transport corral or at the various posts which the recorder has visited; while not so good as either the American timothy hay or the American wheat and oat hays, if it will maintain our animals in good condition it is a great economy to use it, for it costs, laid down in Manila, only \$0.774 gold per 100 pounds as against timothy at \$1.276 and the wheat and oat hays at \$1.045.

Third. The animals on the native corn are doing well thus far; of the shelled corn quite a little is being left uneaten at present, while all of the cracked corn is eaten up. As the oats in the ration are being lessened every day, and more corn added, it is believed the animals will gradually take to the corn more and more, as they do at home; the tests may, however, show that the cracked corn is much better. If successful, it will be an economical feed, costing \$1.28 per 100 pounds, gold, against \$1.70 for oats. Such large quantities are raised here that it is believed the Army could probably buy what it needs.

Fourth. The Guinea grass is excellent, beyond the experimental stage, and cheap. The estimated price was \$0.273 gold per 100 pounds, but that which we are actually getting from the Bureau of Agriculture is costing us \$0.341. A less price should be possible, and if the Army raises this grass near its posts by means of native labor a great saving should result. The tests will help us to determine whether or not the Guinea grass can take

the place of all hay or only a part of it. As pointed out before in this report, it is fed to the exclusion of all hay at the Alabang experimental farm in Laguna Province. This grass is now being grown by the following parties: (1) Alabang Farm, Laguna, (2) Baguio station, (3) Singalong station, (4) Manila city stables, (5) Camp Vicars, Mindanao, (6) Augur Barracks, Jolo, (7) Mr. Atkins, Cavite, (8) Leandro Reyes, Laguna and Rizal Provinces. All of these parties have been successful, more or less, some of them very much so, as at Camp Vicars, Jolo, Alabang and Singalong. The growing of this splendid grass should be encouraged and extended both by the Bureau of Agriculture and the Army. It has not yet been cured and is fed green, daily. That it is peculiarly suited to growing in this Archipelago is a settled fact. Its nutritive ratio, as determined by the Bureau of Agriculture on a dry sample, is very high, being 1 to 5.9. The chief quartermaster, Department of Mindanao, at the request of General Pershing, the department commander, has gone into the subject of growing this grass at Jolo, in sufficient quantities to feed all of the animals at that post—some 615—and finds that about 126 tons are needed each month. His recent report states “estimating that the pay of the farmer will be \$100 per month and that the 8 laborers required will be paid \$11 per month each, or \$88, the cost then of cultivating 126 tons of guinea grass would amount to \$188, while the present cost of the same amount of American hay at \$1.04, amounts to \$2,620.80; the saving thus resulting to the Government is obvious.”

Fifth. The animals are eating all of the quartermaster-general's mixed feed, composed of 4 pounds of alfalfa meal and 4 pounds of oats; it requires considerable wetting to prevent the horses and mules from blowing the meal out of the feed boxes. It is the cheapest American mixture we have for the grain portion of the forage ration, costing \$1.36 gold per hundred pounds as against oats at \$1.70. Should our tests of native palay in lieu of oats prove impossible, this feed is the cheapest and best we now know here. For that reason test No. 13 has been added, composed of the following:

	Pound.
Quartermaster-general's alfalfa meal	4
American oats	4
Native zacate	10
Corn-blade fodder	10

Daily cost per horse \$0.234.

This ration would net an annual saving in this division of about \$75,000 gold, and no American hay would have to be brought in. This mixture of alfalfa meal and oats is also being tested in the following posts, for two months: (1) Fort McKinley, Rizal, (2) Camp Stotsenberg, Pampanga, (3) Camp McGrath, Batangas, (4) Augur Barracks, Jolo, (5) Camp Overton, Mindanao, (6) Torrey Barracks, Mindanao. Special instructions have been sent these places, to insure careful tests.

Sixth. The native barili hay is being eaten all up; it smells sweet and good and has been well cured by the native, Leandro Reyes, of Laguna Province. It does not analyze as high in nutritive qualities as our American wheat or oat hays, but it is the only native hay in these Islands at the present time and the tests will show whether or not our animals will keep in good condition on it. It is all being mowed and cured and baled by hand at present. This man, Leandro Reyes, lacks men and machinery and capital, but is making a determined effort and states he is prepared to furnish the Army some 4,000,000 pounds this year, from January to July. In every reasonable way this man should be encouraged and it is hoped that others will undertake the growing of this grass if the tests show the American animals can thrive on it.

Seventh. The palay tests are being carefully studied; that which we have bought has cost us \$1.34 gold per hundred pounds as against the \$1.70 for oats. This price is higher than was supposed would be the price, which I had estimated in my first report at \$0.84 gold, based on conversations with palay growers. It was found that the present prices of palay were rather high, running from \$1.34 to \$1.95 gold per hundred pounds. The plan of using palay in "manojos" (bunches of rice head, sun dried, with 6 or 8 inch stems) has had to be changed to palay without stems, in 100-pound sacks, because no firm would bid on palay in "manojos" where transportation was involved, in view of the fear that the rice head would so separate from the stems in transit as to preclude delivery in good "manajo" condition. In the early days here, palay was furnished to the cavalry in "manojos" by local growers near our station, and was fed in "manojos" with such excellent results that it was desired to conduct these palay tests the same way, but while it is still possible to secure palay in "manojos" near some of our posts, in fact, a great many of them, by purchase near the posts, it has been impossible to secure it for the tests we are making

except in the 100-pound sacks of palay minus the stems. However, as this is the commercial custom of buying, selling, and transporting palay here, it is believed the board must test the palay in this commercial form, which would be the way it would have to be procured in large quantities, especially if to be stored and transported. The prices, in "manojos" delivered to near by Army posts by wagons, would, of course, be cheaper than in the 100-pound sacks, and if the palay is to be used in lieu of oats, it is believed that purchases can be made in "manojos" by local quartermasters for their own posts, just as was done before. As the palay for the tests was not received until January 20, no report can be made yet as to its feeding qualities. Its storage qualities are known to be good, equal to oats.

From the Bureau of Agriculture it is learned that the amount of palay produced in this Archipelago during the past year amounts to 1,697,310,000 pounds and to this may be added 370,491,000 pounds that were imported into these Islands during the last year, principally from Saigon and neighboring ports. From these figures it does not seem that the purchase of the supply necessary for the Army animals, if it should be decided to use palay in lieu of oats, should give much trouble; we need some 25,000,000 pounds annually. Dealers here believe that the price we paid for our experimental lot of 17,280 pounds, \$1.34 gold per hundred pounds, is about as low as the Government could expect to secure, even on the entire quantity needed yearly. Even this price shows an enormous saving over the present cost of our oats, \$1.70 gold. Two firms here, Smith Bell & Co. and Señora Rosario, state that they are prepared to make a contract at any time with the Army, to furnish all the palay necessary; the prices would vary with the year's crop.

Whether or not the feeding value of the palay will be as good as our oats is one of the things we hope to determine by the present experiments.

TESTS BEING MADE.

In order to inform the board exactly what tests are being made by me at the land transport corral, Table 10 is given below to show all of the thirteen tests, and the prices are put in according to what we have actually had to pay for the components bought for the tests.

TABLE 10.—*Showing prices actually paid by the board (these tests are now being conducted in Manila).*

[All money in gold.]

No.	Ration.	Unit cost, pound.	Daily cost per horse	Remarks.
1	12 pounds American oats.....	\$0.0170	\$0.383	
	14 pounds American timothy hay.....	.0128		
	9 pounds American oats.....	.0170	269	
2	11 pounds zacate.....	.00394		
	9½ pounds Kansas hay.....	.00774	259	Eliminated
	9 pounds Forage Factory crushed feed.....	.0159		
3	11 pounds zacate.....	.00394	225	
	9 pounds Kansas hay.....	.00774		
	9 pounds quartermaster-general mixed feed.....	.0136	225	
4	11 pounds zacate.....	.00394		
	9½ pounds Kansas hay.....	.00774	239	
5	12 pounds palay.....	.0134		
	20 pounds zacate.....	.00394	30	
6	12 pounds palay.....	.0134		
	10 pounds zacate.....	.00394	256	
	8 pounds fodder.....	.0125		
7	12 pounds palay.....	.0134	259	
	10 pounds zacate.....	.00394		
	8 pounds barili hay.....	.0070	251	
8	12 pounds palay.....	.0134		
	14 pounds barili hay.....	.0070	218	
	12 pounds palay.....	.0134		
9	10 pounds Guinea grass.....	.00341	265	
	8 pounds barili hay.....	.0070		
	8 pounds whole corn.....	.0129	236	
10	15 pounds zacate.....	.00394		
	8 pounds barili hay.....	.0070	248	
	8 pounds cracked corn.....	.0137		
11	11 pounds zacate.....	.00394	248	
	9 pounds fodder.....	.0125		
12	12 pounds palay.....	.0134	248	
	22 pounds Guinea grass.....	.00341		
	8 pounds quartermaster-general mixed feed.....	.0136	248	
13	10 pounds zacate.....	.00394		
	8 pounds fodder.....	.0125		

PRESENT DIVISION FORAGE RATION, WITH COST.

The present cost of the daily forage for one horse, in this division, under recent orders, is as follows:

1. Cavalry and riding horse ration:

	Cost (gold).
8 pounds oats	\$0.278
11 pounds native green zacate	
9½ pounds American oat hay	

2. Draft animal ration:

9 pounds oats294
11 pounds native green zacate	
9½ pounds American oat hay	

From this it can be seen that each of the test rations being tried will result in economy, except test No. 6, but greater economy will result whenever the fodder is used if we substitute American wheat or oat hay, which costs only \$1.045 gold per hundred pounds as against \$1.25 gold for the fodder.

Leaving aside, for the moment, the question of cost, let us consider the nutritive value of these various test rations, which after all, will determine whether or not any of these rations can be used. The nutritive values of these test rations can best be shown by giving "nutritive ratios" of them; this is done below in Table 11:

NUTRITIVE RATIOS.

TABLE 11.—*Nutritive ratios of the forage rations being tested by this board.*

Test No	Components	Nutritive ratio.
1	Oats and timothy hay	1 to 8.8
2	Oats, zacate and Kansas hay	1 to 7.9
3	Forage Factory crushed feed, zacate, and Kansas hay	1 to 7.9
4	Quartermaster-general, mixed feed, zacate, and Kansas hay	1 to 7.0
5	Palay and zacate	1 to 7.9
6	Palay, zacate, and fodder	1 to 9.4
7	Palay, zacate, and barili hay	1 to 10.2
8	Palay and barili hay	1 to 12.0
9	Palay, Guinea grass, and barili hay	1 to 8.1
10	Shelled corn, zacate, and barili hay	1 to 9.4
11	Cracked corn, zacate, and fodder	1 to 10.3
12	Palay and Guinea grass	1 to 5.3
13	Quartermaster-general mixed feed, zacate, and fodder	1 to 6.9

The best-authorities on horse feeding state that the following nutritive ratios are required, theoretically:

1. For horse doing light work 1 to 7
2. For horse doing medium work 1 to 6.5
3. For horse doing heavy work 1 to 6.2

In order to make Table 11 clear, the term "nutritive ratio" may be explained as follows:

When we speak of a feed having a nutritive ratio of say 1 to 5, we mean that in a quantity sufficient to contain 1 pound of protein the weight of the carbohydrates plus $2\frac{1}{4}$ times the fats will be five pounds, or, to use a simplified expression, the protein is to the nonprotein as 1 is to 5. Therefore the smaller the second figure of the ratio the richer the feed.

But all of the best authorities agree that the standards given above have been varied more or less with good results, and therefore the tests now being conducted, based primarily on cost, will be carefully observed and each animal studied so that no permanent injury will result. Should any test ration prove insufficient in nutrition for the maintenance of weight, condition, and energy, it will be built up; if it reaches a cost too high, showing no economy will result, the ration will be regarded as useless and stopped, but by remembering all of the possible variations which can be secured in making mixtures, as learned through our alligation in arithmetic, we can make almost a countless

number of changes in rations, each one of the changes giving a different price, so that finally we may get several good rations at a cheap price. This will require time and patience.

GENERAL ORDERS, No. 88, PHILIPPINES DIVISION—FORAGE.

Since our last meeting General Orders, No. 88, Philippines Division, dated December 14, 1910, has been published, prescribing the daily rations for the Army animals here. This order is based on conferences with the commanding officers of three of the large cavalry garrisons in these Islands, and nets an annual saving of about \$12,000 to \$15,000 gold. This order appears, in part, as follows:

HEADQUARTERS, PHILIPPINES DIVISION,
Manila, P. I., December 14, 1910.

GENERAL ORDERS, }
No. 88. }

[Extract]

* * * * *

11. Paragraph 2, General Orders, No. 38, these headquarters, May 3, 1910, is revoked and the following instructions relative to the foraging of public animals are substituted therefor:

(1) The daily forage rations will be as follows:

No.	Class	Oats.	Hay	Zacate
		Pounds	Pounds	Pounds
1	Cavalry horses.....	8	9½	11
2	Riding horses.....	8	9½	11
3	Officers' mounts.....	8	9½	11
4	Pack mules.....	8	9½	11
5	Riding mules.....	8	9½	11
6	Draft horses.....	9	9½	11
7	Draft mules.....	9	9½	11

By command of Major General Duvall:

LEA FEBIGER,
Lieutenant-Colonel, General Staff, Chief of Staff.

Official:

H. O. S. HEISTAND, *Adjutant-General.*

FORAGE RAISING AT TRINIDAD STOCK FARM.

* * * * *

(B) *Trinidad stock farm.*—The forage raising at Baguio is practically all done at the experimental farm, only stock being handled at this stock farm. The forages used vary greatly for each animal, but the average daily forage ration costs about 30 cents gold. Oats, corn, Forage Factory crushed feed, bran, timothy hay, some fodder, some palay, in "paddy" form, and grazing are used. Each animal being bred has a carefully

prepared special ration, varying as growth and condition of animal make advisable. It might be remarked here that the type of mestizo horse being raised here, from Arabian stallions and native mares, is so splendid an improvement over the present native horse as to justify the remark of the present Director of Agriculture, that "if we keep these Islands for the next fifty years we will have all the horses we need right here."

After many inspections by the military authorities of the hays and feeding of same in different Army posts in the Philippines during the last six months, the conclusion can be drawn safely that the wheat and oat hays now used need never again be changed back to the more expensive timothy. Also that Kansas prairie hay, so much cheaper, could be substituted, probably wholly, for the wheat and oat hays. In order to be well within the limit of safety, however, a half and half substitution is to be made for the next fiscal year, if possible.

* * * * *

CORN-BLADE FODDER.

In compliance with instructions from the board, the matter of obtaining 200,000 pounds of corn-blade fodder, through the Bureau of Agriculture, for feeding it more extensively at Fort McKinley than we have done thus far in our small tests at the Pasay corral, was taken up with the Director of the Bureau, and the following correspondence shows the progress made in securing the amount specified, thus far.

FORAGE BOARD,

Manila, P. I., January 27, 1911.

The DIRECTOR, BUREAU OF AGRICULTURE,

Manila, P. I.

SIR: I have the honor to inform you that at a meeting of this board on January 25, 1911, the following resolution was passed:

"The board directed the recorder to write a letter to the Director of Agriculture, requesting him to ascertain the present price at which 200,000 pounds of baled corn-blade fodder can be obtained, and whether or not it is possible, through the efforts of his Department, to secure this amount this season. The recorder was directed, upon receipt of the reply from the Bureau of Agriculture, to confer with Colonel Hodgson, chief quartermaster, Philippines Division, with a view to the purchase of the 200,000 pounds of this fodder, for trial at Fort McKinley, provided the price was such that a material saving would result in its use."

I therefore desire to submit this letter to you, as directed, and to request that you inform me, as soon as your investigations into the matter will enable you to do so, what the price will be and if your department can secure the amount named. The price should be the price to the Army, delivered in Manila, or delivered at Fort William McKinley, if such latter delivery will secure a lower price.

It is requested that the price finally quoted by you be the price per one hundred pounds, on bales thoroughly cured, consisting of the leaves of the corn only, similar to those bales of this corn-blade fodder recently purchased from your Bureau by the Army. It is desired that each bale weigh approximately one hundred pounds.

The board does not desire that your Bureau obligate itself to any person or persons to purchase this fodder, because after the net price is known and the possibility of securing the fodder has been determined, it will be necessary to take the matter of purchase up with the chief quartermaster, Philippines Division, in order for him to decide whether or not the purchase can be made out of his funds, whether the money can be spared this fiscal year, and whether there is economy in such purchase.

Awaiting your reply,

Very respectfully,

(Signed) JOHN J. BONIFACE,
Captain, Second Cavalry, Recorder.

BUREAU OF AGRICULTURE,
Manila, P. I., March 20, 1911.

SIR: Replying to your letter of January 27, relative to the matter of some 200,000 pounds of baled corn blades, I have the honor to advise that we have put a man in the field for about ten days to investigate the possibility of securing this amount of fodder. Most of the growers interviewed seemed anxious to take the matter up, but of course were entirely ignorant of the possibilities of securing the amount desired. Quite a number expressed a willingness to supply the entire amount needed, but one who knows the exact conditions can see that it would be impossible for them to do so under present conditions.

One main difficulty seems to be the matter of transportation. These people have no presses, hence can not pack the fodder in bales and secure a minimum freight rate. A case in point happened a week or so ago, in which a party in Batangas shipped 800 kilos of corn blades to the Forage Factory; this fodder not being baled, of course occupied the entire car. The local freight rate, by kilos, amounted to approximately ₱1.50; the railroad company, however, insisted that we pay by carload rate, which amounts to about ₱8.50. This will illustrate the difficulty we are having at the present time in getting the fodder to any one central point. The final price would be governed more or less by the question of freight. Those who have been consulted regarding the matter seemed to be satisfied with from ₱40 to ₱45 per thousand kilos, but transporting it to Manila increases the cost anywhere from ₱2 to ₱10 per ton; then the question of rehandling at Manila still further increases the cost. It is doubtful if the fodder could be collected in anything like the quantities desired for less than ₱55 per thousand kilos. This does not mean, however, that as soon as the people have learned how to handle it and so pack it as to get the minimum freight rate, that the price can not be materially lowered.

Very respectfully,

(Signed) G. E. NESOM,
Director of Agriculture.

To Capt. JOHN J. BONIFACE,
Secretary of Forage Board, Manila, P. I.

FORAGE BOARD,
Manila, P. I., March 25, 1911.

Dr. G. E. NESOM,

Director, Bureau of Agriculture, Manila, P. I.

SIR: I have the honor to acknowledge receipt of your letter dated March 20, 1911, referring to your efforts to secure 200,000 pounds of corn-blade fodder, if procurable at a price so reasonable as to permit purchase by the Army at a saving over the present American hay now used.

The Board is finding that this corn-blade fodder is being so readily eaten by the animals now under test at the land transport corral, and that these animals appear thus far to be so well keeping in good, hard condition, that it is agreeably impressed with your statement that "most of the growers interviewed seemed anxious to take the matter up," and hopes that the continued efforts of your Bureau in this direction will prove successful this year.

The board is informed by your Assistant Director that you are continuing your investigations along this line, visiting many growers and studying the possibilities of reasonable freight rates and deliveries; such work should ultimately result in being able to secure this roughage at a saving to the Government. The board believes this matter worth all of the time and energy that your Bureau is giving to it, for if the Army can procure this roughage in sufficient quantities annually to take the place of the present American hay, at such figures that a saving will result to the Government, it will not only lessen the present cost of forage to the Army Here, but will create a market for one Philippine product now practically wholly wasted, besides saving all transportation of hay from the United States for Army use.

The prices given by you, taking the maximum, figure out as too high to be used, but with further investigation and encouragement of native growers, it seems reasonable to believe that lower prices will be secured in time, as the native growers awaken to the fact that a large market may exist for this roughage, once they properly cure and bale it.

At present the Army is securing two kinds of hay from America, as follows:

1. Wheat and oat hay, costing delivered here, \$1.045 gold per hundred pounds.

2. Kansas prairie hay, costing delivered here, \$0.774 gold per hundred pounds.

The maximum prices given by you for this corn-blade fodder figure out as follows:

1. At ₱45 this is at the rate of \$1.023 per hundred pounds.

2. When your estimated maximum freight rate is added, it brings the price up to ₱55 per 1,000 kilos, or at a rate of \$1.25 gold per hundred pounds, delivered in Manila.

This shows that the increase of cost over our present American hay is very considerable. As pointed out by you, a still further charge would have to be made for hauling from the railroad station in Manila to point of delivery.

From the quoted costs of our present American hay given above you must deduct 15 cents gold, the transportation charges we pay now for every hundred pounds, San Francisco or Seattle to Manila. This shows that the price in the United States to the Army, for these two hays, now,

is, respectively, \$0.895 and \$0.625 delivered at either San Francisco or Seattle, according to the terms of the contract.

It is believed by the board that the local prices here in the Philippine Islands should not exceed these figures, perhaps an average price of say \$0.75 gold per hundred pounds, delivered at the post needing it, should be about what we should eventually expect, may be even lower.

The board will be glad to hear further from you, from time to time, as your investigations progress.

Very respectfully,

(Signed) JOHN J. BONIFACE,
Captain, Second Cavalry, Recorder.

*The above report covers the instructions to the recorder to visit certain southern island posts and to investigate the possibility of securing this season the corn-blade fodder.

The report given below covers, in detail, the results of the forage feeding tests conducted during February and March, 1911, for the board.

Respectfully submitted.

(Signed) JOHN J. BONIFACE,
Captain, Second Cavalry, Recorder.

REPORT ON FEEDING TESTS.

(Conducted by recorder of this board, during February and March, 1911, at the land transport corral, Manila.)

Pursuant to the instructions of this board, fifteen feeding tests have been conducted under my charge. Table 12, herewith, shows the kinds of forage used and chemical analyses of same.

TABLE 12.—Composition of forage.

HAYS

Name	Percentage composition.						Authority
	Water.	Ash	Pro- teids.	Carbo- hy- drates.	Fat	Fiber	
Timothy	13.2	4.4	5.9	45	2.5	29	Ing' . University of Cali- fornia.
Wheat	8.82	5.58	5.96	55.15	1.81	22.48	
Oat	10	5.59	5.7	39.25	2.28	37.19	Do.
Wheat and oat	9.4	5.6	5.8	47.2	2.1	29.8	Do.
Kansas prairie	11.96	7.4	5.4	48.8	2.2	29.3	Bureau of Science.
Barili							None.
Barit	13.5	15.62	3.6	38.8	1.3	27.1	Bureau of Science
Luyaluya							None.
Corn-blade fodder	30	5.5	6	36.7	1.4	21.4	Henry.

GREEN FORAGE.*

Guinea	77.9	2.9	3.3	8.1	.6	7.3	Bureau of Agricul- ture.
Zacate							None.
Barili	82.6	2.2	3	6.7	.9	4.7	Bureau of Science
Barit	68.8	6.6	2.8	11.9	1.5	8.4	Do.
Luyaluya							None.
Corn fodder	79.3	1.2	1.8	12.2	.5	5	Henry.

* Percentages of proteids, carbohydrates, fats and fiber are of the total dry matter

TABLE 12.—*Composition of forage*—Continued.

CONCENTRATES.

Name.	percentage composition.						Authority.
	Water.	Ash.	Pro- teids	Carbo- hy- drates.	Fat.	Fiber.	
Oats.....	11	8	11.8	59.7	5	9.5	Ingle.
Shelled corn.....	10.9	1.5	10.5	68.6	5.4	2.1	Do.
Cracked corn.....	10.9	1.5	10.5	69.6	5.4	2.1	Do.
Palay.....	12.9	7.5	11.5	54.3	9.5	4.3	Bureau of Science.
Alfalfa meal.....	16.1	9.1	22.1	32.9	2.5	17.3	Do.
American bran.....	11.9	5.8	15.4	53.9	4	9	Henry.
Forage Factory crushed feed.	Not available. Nearly equal to oats.						
Australian compressed fodder, V. B. crushed feed. ^b	14.1	5.2	6.2	22.3	2.2	26.8	Bureau of Science.
Quartermaster-general's mixed feed.	18.6	6.1	17	46.3	3.8	13.4	Do.

^b Not used by board in these tests, but used extensively in Manila and therefore put in this table for comparative purposes

This table although incomplete, is the best one obtainable here, and is of much value in studying forages, but the chemical analyses alone, of different feeding materials, is not sufficient for properly balancing rations. In the early days of agricultural work, particularly under Grouven in 1859, nutritive ratios were deduced by using chemical analyses as above; these ratios or "standards" fell short of requirements, since they considered the *total* nutrients instead of the digestible portions.

In all foods there is always a certain portion of each nutrient, whether it be protein, carbohydrates, or fats, which is not digested or assimilated, but passes through the body and is valuable only as manure. In order to ascertain how much of each food is not digested, the material is weighed and chemically analyzed before consumption, and the weight and composition of the animal excrement is also determined. The difference of these two analyses is taken as the digestible portions, and are termed "digestion coefficients." For each food this "digestion coefficient" may vary considerably from the chemical analyses—the more concentrated the food the higher, as a rule, will be the "digestion coefficient." For example; while about 57 per cent of the protein is digested in oat hay, 78 per cent of bran is digested, and as much as 88 per cent of certain peas and beans is digested.

The vast amount of work of the chemist and animal husbandry expert in this direction must be apparent. Some experts feel that such tables are, after all, not very accurate, but due reflection will show that enormous gain has already come in animal

feeding from these sources. Such tables of chemical composition feeding standards and digestible nutrients are efforts towards a desired end, and should be made use of when conducting actual feeding tests. Therefore table 13 is given below, showing "digestible nutrients" of the forages being tested by this board.

This table is not wholly complete, simply because the data has not been compiled by either the Bureau of Science or the Bureau of Agriculture here up to date.

TABLE 13.—*Digestible nutrients.*

HAYS.

Name.	Dry matter.	Per 100 pounds of feed.			Nutritive ratio 1 to—	Authority
		Protein.	Nitrogen free extract.	Ether extract.		
Timothy.....	86.8	2.9	43.7	1.4	16.2	University of California.
Wheat.....	91.2	3.6	46.1	1.1	13.2	Do.
Oat.....	89.9	4.5	43.7	1.5	10.5	Do
Wheat and oat.....	90.6	4.3	46.4	1.5	11.6	Do
Kansas prairie.....	90	3.4	44.1	1.1	13.6	Wild hay, University of California.
Corn-blade fodder.....	70	3.7	21.1	.9	6.3	Henry.
Barill.....						Bureau of Agriculture. (E)
Barit.....						Do
Luyaluya.....	No tests. About equal to barill.					

GREEN FORAGES.

Guinea.....	32	2.8	9	.6	3.9	Bureau of Agriculture (E)
Barill.....	17.4	2.3	8.6	(*)	3.3	Do. (E)
Barit.....	31.2	2.1	15.4	(*)	7.4	Do (E)
Luyaluya.....	No tests. About equal to barill					
Corn fodder.....	21	1	11.6	.4	12.5	University of California.

* Ether extract contained in carbohydrate figures

CONCENTRATES.

Oats.....	89	9.2	47.3	4.2	6.2	University of California.
Shelled corn.....						Do.
Cracked corn.....	89.4	7.8	66.7	4.3	9.8	Do
Palay.....	87.1	4.9	46.9	1.5	10.3	Bureau of Agriculture. (E)
Alfalfa meal.....	89.1	12.3	37.1	1.6	3.3	University of California.
Wheat bran.....	61	12.3	37.1	2.6	3.5	Kansas Agricultural College
Forage Factory crushed feed.....	86	10.8	56.6	3.5	6	

The "digestible nutrients" of all of the items marked (E) have had to be *Estimated* by the Bureau of Agriculture here, owing to no tests ever having been conducted

It will be seen, from this table, the difficulties the recorder has encountered in determining the nutritive ratios that should have been used in our tests. The proper balancing of our experimental rations has consequently been so unsatisfactory that it is hoped the Bureau of Agriculture here will, in the near

future, conduct "digestible nutrient" tests of all the native forage components, for future reference. However, as some table of nutritive ratios had to be adopted by the recorder, the above incomplete and doubtless inaccurate one was, perforce, used so far as possible.

In considering these tables it is necessary to know the "Feeding standards" that appear below, showing what a horse *requires* in his daily feed, to maintain weight and condition:

TABLE 13A.—Feeding standards—Wolf.

Animal.	Nutritive digestible substances needed daily, per 1,000 pounds live weight.				
	Dry matter.	Protein.	Carbohydrates.	Fat	Nutritive ratio.
Horse 1 (light work)-----	17	1.5	9.5	0.4	1 : 70
Horse 2 (medium work)-----	20	1.7	10.4	0.6	1 : 70
Horse 3 (heavy work)-----	20	2.3	12.5	0.8	1 : 60
Horse 4 (At rest. This known as the "maintenance ration" of the horse)-----	17	.5	8.75	(*)	1 : 17.5

* Included in carbohydrates.

* * * * *

Table 15 herewith gives a recapitulation, in condensed form, of Table 14 and the various tests that are explained at length therein.

TABLE 15.—Recapitulation of feeding test results.

Test No.	Horses.	Mules	Period.	Ration.	Results.
			<i>Months.</i>		
1	2	2	2.5	12 oats, 14 timothy hay-----	Excellent.
2	2	2	2.5	9 oats, 11 zacate, 9.3 Kansas hay-----	Satisfactory.
3	4	4	2	9 Forage Factory crushed feed, 11 zacate, 9.3 Kansas hay-----	Unsatisfactory.
	19	37	4	9 Forage Factory crushed feed, 11 zacate, 9.3 wheat and oat hay-----	Do.
	19	23	4	9 oats, 11 zacate, 9.3 wheat and oat hay-----	Satisfactory.
4	2	2	2	8 Quartermaster-general mixed feed, 11 zacate, 9.3 Kansas hay-----	Satisfactory for garrison.
				8 Quartermaster-general mixed feed, 11 zacate, 9.3 wheat and oat hay-----	Do.
				8 oats, 11 zacate, 9.3 wheat and oat hay-----	Satisfactory.
4 A	2	2	5	1 oats, 9 palay, 11 zacate, 9.3 Kansas hay-----	Undetermined.
5	2	2	2	12 palay, 20 zacate-----	Unsatisfactory.
6	2	2	2.3	12 palay, 10 zacate, 8 corn-blade fodder-----	Do.
7	2	2	2.3	12 palay, 11 zacate, 8 barili hay-----	Promising.
8	2	2	.7	12 palay, 14 barili hay-----	Failure.
9	2	2	2.3	12 palay, 10 Guinea grass, 8 barili hay-----	Promising.
10	2	2	2.3	8 shelled corn, 15 zacate, 8 barili hay-----	Unsatisfactory.
11	2	2	2.3	8 cracked corn, 11 zacate, 9 corn-blade fodder-----	Promising.
12	2	2	2.3	12 palay, 22 Guinea grass-----	Unsatisfactory.
				8 Quartermaster-general mixed feed, 10 zacate, 10 corn-blade fodder-----	Promising.
13	2	2	1.7	1 oats, 9 palay, 10 zacate, 10 corn-blade fodder-----	Do.
13 A	2	2	.6	4 cracked corn, 4 alfalfa meal, 10 Guinea grass, 10 Kansas hay-----	Do.
14	2	2	.1	4 palay, 4 cracked corn, 10 Guinea grass, 10 Kansas hay-----	Do.
14 A	2	2	.6		Do.
15	6	6	.3	Palatability test, barili hay-----	Unsatisfactory.



PLATE VI—FORAGE BEANS, THREE MONTHS OLD, SINGALONG EXPERIMENT STATION.

* * * * *

RESULTS TO DATE.

The results of our tests and investigations thus far have been such as to make it desirable to continue the tests that appear to promise success: tests Nos. 7, 9, 11, 13, 13A, 14, and 14A. It was thought that by increasing the various components somewhat, as might appear best in each case, the weights of the animals would be brought up and maintained. From the first the desire has been, of course, to endeavor to secure a native forage here. Tests Nos. 7, 9, and 11 do this, while tests Nos. 13, 13A, 14, and 14A use some American oats or alfalfa meal or Kansas hay.

Hays.—Among the native hays tried, the corn-blade fodder is, without doubt, a satisfactory substitute for American hay. The difficulty is in getting it, as pointed out in this report. It is the most satisfactory hay to be had here, far excelling the barit, barili, or luyaluya hays in nutritive qualities and palatability. Its price, however, must be much lower before there will be any economy. It is not to be preferred to our present wheat and oat hay at \$1.045 or to the mixed American hay we expect to feed in the Army here the next fiscal year, which will be composed of wheat and oat hay and Kansas prairie hay, fed half and half, and costing but \$0.91 per hundred pounds as against the corn-blade fodder at \$1.25.

The military authorities here are limited to one method of purchasing forage; that method requires advertisements for bids. If no bids are received, then open-market purchases can be made, within the appropriations at hand for forage. This corn-blade fodder is here in these Islands in large quantities, and if the Bureau of Agriculture, by determined and combined effort of instructions among the native corn growers can succeed in having these farmers produce and prepare this type of hay in large quantities, and at reasonable prices, delivered where required (as is the regular practice required in all Army contracts) this hay can take the place of our American hay. But it will require a year or more of positive campaigning work on the part of the Bureau of Agriculture to accomplish any results. Also as far as barit, barili, and luyaluya hays are concerned, it will be necessary for the Bureau of Agriculture, by advice, experiment, investigation, and constant coöperation with native growers to so improve the present methods of curing these hays as to make them retain the palatability they all possess when

green and lack at present when cured into hay by native methods. As these hays are all native here, they should not be ignored because foreign grass seeds are being tested here.

Green forages.—Those now grown here and known as successful forages are green-corn fodder, Guinea grass, zacate (barit, barili, and luyaluya) and teosinte. All of these have been tried by the military authorities in these Islands and all but teosinte are being fed by the Army now, either on contracts or on tests, with satisfactory results when fed in lieu of a portion of the dry hays. This report shows the proportion, and it may be added that at Camp Stotsenberg and Camp McGrath the green-corn fodder, furnished on contracts during the past year, has been found very satisfactory and economical, costing only \$0.215 at Camp Stotsenberg and \$0.30 at Camp McGrath, per hundred pounds, delivered. The green barili is being fed for the first time at the land transport corral in our tests, with satisfactory results, and costs but \$0.30 per hundred pounds, while the contractor's bid for 8,000 pounds daily for the coming year is but \$0.27 delivered at the corral, as against \$0.50 bid for "barit."

The most desirable green forage grown here thus far is the Guinea grass, but only the Bureau of Agriculture has it and in but very limited quantities. No outside parties grow it. The military authorities recently received one bid of \$0.46, for furnishing 8,000 pounds to the land transport corral, daily. The bidder was a firm named Johnson & Aitken, Cavite. This firm has none growing now, but were willing to go into the work if their bid was accepted. The bid was so much higher, however, than the bid for green barili that it had to be rejected. No one now known is growing teosinte, although about six years ago there were several parties growing it.

From the above it can readily be seen that the Army will be compelled to continue importing American hays for some years to come, or until the native growers here can be induced to furnish, in necessary quantities, some of the hays referred to above, and using such of the green forages, in lieu of a portion of the hay allowance, as can be contracted for.

Grains.—The experiments of this board show that it will probably be possible to use either palay or cracked corn in lieu of a portion of the American oats, using a mixture. Our April tests will, it is expected, determine the best mixture. Until certain results are assured, however, the present ration of oats

(8 pounds for riding and cavalry horses and pack mules, and 9 pounds for draft animals) is the most economical grain ration to be had, with due regard to condition of the animals.

APRIL TESTS.

Doctor Piper, forage expert of the Department of Agriculture, Washington, District of Columbia, has recently been brought here by the Bureau of Agriculture, with a view to thorough forage investigations. He has been shown the report of this board. In looking over the tests which we have been conducting, he commented on our having incorporated *several* native components in each of the different test rations and pointed out that should such a ration fail it would be impossible to determine just which native component had caused the failure. Therefore, in making up the tests for April, this point has been considered, and Table 16 below gives the eight test rations being tried now, at the land transport corral, Manila.

TABLE 16.—*Experimental rations being tested during April, 1911, by this board.*

Test No.	Horses.	Mules.	Components	Test of—	Daily cost
1	3	3	9 oats, 11 zacate, 9.3 wheat and oat hay	Compressed	\$0 297
2	3	3	5 oats, 4 palay, 11 zacate, 9.3 hay	Palay	.280
3	3	3	5 oats, 4 cracked corn, 11 zacate, 9.3 wheat and oat hay	Corn	.281
4	3	3	5 cracked corn, 5 palay, 11 zacate, 9.3 wheat and oat hay	Corn and palay	.276
5	3	3	9 oats, 11 zacate, 9.3 corn-blade fodder	Fodder	.313
6	3	3	9 oats, 11 zacate, 9.3 Guinea hay	Guinea	.271
7	3	3	9 oats, 11 barili grass, 9.3 wheat and oat hay	Barili grass	.284
8	3	3	9 oats, 11 Guinea grass, 9.3 wheat and oat hay	Guinea grass	.288

These tests began April 1, 1911, and will close April 30, 1911. The Guinea hay was cured from the Guinea grass, by the Bureau of Agriculture, this month. The amount cured was about 4 tons. It is the first time it has been cured here, so far as known.

A final report will be rendered by me about May 10, showing the results of these April tests. It is also expected that before that time the Bureau of Agriculture will have prepared, in complete form, a report of its forage experiments since its organization in 1901 to date. It is desired to include a copy of that report in the proceedings of this board, for the information of the board and of the Secretary of War.

Respectfully submitted.

(Signed) JNO. J. BONIFACE,
Captain, Second Cavalry, Recorder.

The board after carefully considering the above reports of the recorder, approved the same and directed the recorder to complete the April tests now under way, and to submit proper report at the next meeting.

Doctor Piper, forage expert, United States Department of Agriculture, appeared before the board, and participated in its deliberations. He expressed the opinion that Guinea *hay* will not be a suitable permanent hay, but submitted to the board samples of hay made here within the past two months from Rhodes grass, and stated that it would probably be found very desirable here. It is a native of Chile.

Doctor Nesom, Director of Agriculture, then informed the board that his Bureau was continuing its efforts towards procuring quantities of corn-blade fodder and outlined the difficulties encountered thus far.

Doctor Nesom also explained to the board that his Bureau has now begun some thorough, systematic forage-growing experiments near Tarlac, and is bringing an expert here from the United States to have charge of this work permanently.

There being no further business before it, the board then adjourned, at 12 noon, to meet at the call of the president.

(Signed) G. E. NESOM,

Director of Agriculture, President.

(Signed) JNO. J. BONIFACE,

Captain, Second Cavalry, Recorder.

* * * * *

This report covers the tests conducted by this board during April, 1911, at the land transport corral, Manila. Table 17 below gives the results in detail. All of these tests were successful, as shown by the table.

TABLE 17.—April, 1911, feeding tests by forage board.

Test No.	Horses.	Mules.	Nutritive ratio.	Digestible nutrients.	Gain.	Loss.	Final condition.	Results.
				<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>		
1	3	3	1: 8.4	12.28	74	48	Excellent.....	Successful.
2	3	3	1: 9.0	11.95	98	14	do.....	Do.
3	3	3	1: 8.8	12.95	280	0	do.....	Do.
4	3	3	1: 10.0	11.47	188	0	do.....	Do.
5	3	3	1: 6.6	12.06	250	10	do.....	Do.
6	3	3	1: 8.0	11.98	120	8	do.....	Do.
7	3	3	1: 7.4	11.51	104	6	do.....	Do.
8	3	3	1: 7.2	11.66	290	0	do.....	Do.

(All above animals heavy draft. These animals were those on the February and March tests, and were all underweight April 1.)

The best authorities state that 9.25 pounds of digestible nutrients are needed by the horse daily, as a minimum. By reference to Table 17 it will be seen that all of these April test rations exceed this by several pounds.

The results of all of our tests have shown that any of these April tests can be used and that the storage qualities of the components in the April tests are excellent, except the cracked corn, which will always develop weevils after several months' storage.

The costs of these April test rations are given in Table 16 of this report. Test No. 1 is the present ration, and all the other seven tests are somewhat cheaper except Test No. 5.

The experiments of this board, however, have demonstrated to the members that oats should permanently form a *portion* of the grain ration, because of its high feeding qualities, excellent storage qualities, and the importance of always having a reserve on hand here for emergencies.

The board has now thoroughly investigated forage conditions here and its work is regarded as finished. The board, therefore, finds as follows:

First. That native cracked corn can be fed in lieu of a portion of the oats now used; the best mixture appears to be 5 pounds of oats and 4 pounds of the cracked corn per day.

Second. That native palay can be fed in lieu of a portion of the oats now used; the best mixture appears to be 5 pounds of oats and 4 pounds of palay per day. The palay was not found as palatable or as nutritious, or as safe, however, as the cracked corn.

Third. That native green forage (barit, barili, luyaluya, Guinea grass, green-corn fodder) can be fed in lieu of a portion of the hay allowance when it can be procured in sufficient quantities and at prices that enable a saving in cost over all hay. The Army is now feeding these green forages wherever possible and has been doing so for a considerable time.

Fourth. That cured and baled native corn-blade fodder, baled Guinea hay or baled Rhodes grass hay can be used in lieu of American hay, entirely, as these three hays can be grown here successfully, but at the present time it is impossible to procure any of the hays referred to, as there is no one in the business here, and therefore no supply; the Bureau of Agriculture is endeavoring to develop the industry. Whether or not these hays can eventually be utilized to replace American hays will depend

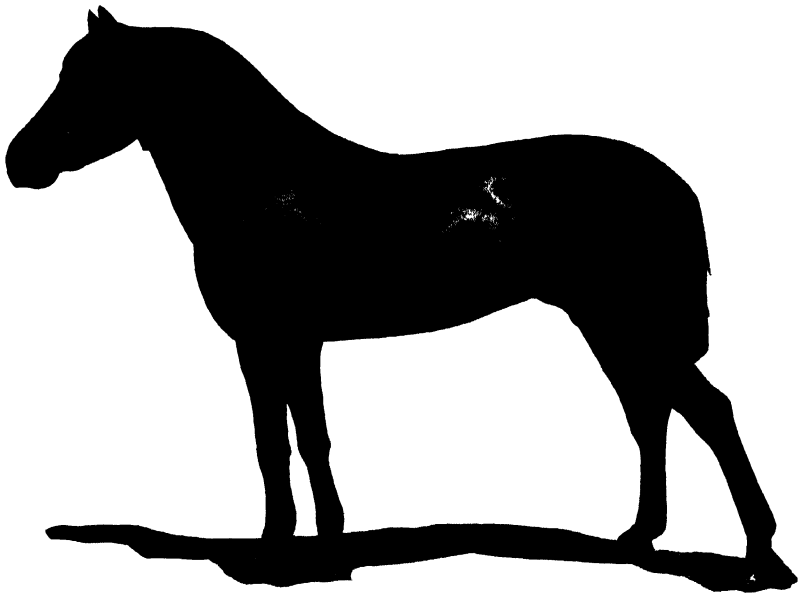
on the prices obtainable when the industry has developed a sufficient supply.

Fifth. That whenever sufficient quantities of the cracked native corn can be procured at such prices as to result in economy to the Government, the Army will be prepared to advertise for bids. At present no corn is cracked except in the small forage factory belonging to the Bureau of Agriculture.

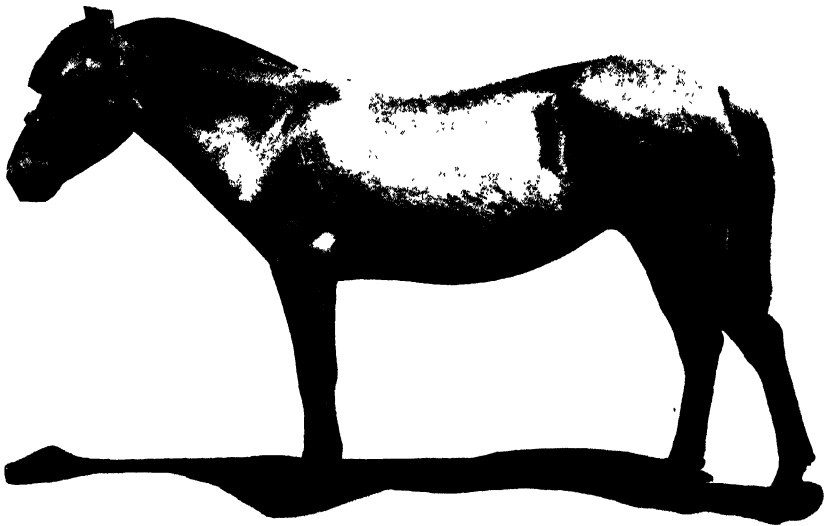
There being no further business before it, the board then, at 12 noon, adjourned *sine die*.

(Signed) F. G. HODGSON,
Colonel, Assistant Quartermaster-General,
United States Army, Acting President.

(Signed) JNO. J. BONIFACE,
Captain, Second Cavalry, Recorder.



(a)



(b)

PLATE I (a) "CARBONERO," NATIVE STALLION, HEIGHT, 137 CENTIMETERS (54 INCHES) (One of the sires being used on the Government stock farm at Alabang for pure native horse breeding.) (b) "ULILA," NATIVE MARE (Property of the Bureau of Agriculture.)

LIVE-STOCK NUMBER

THE PHILIPPINE *Agricultural Review*

VOL. IV

SEPTEMBER, 1911

No. 9

CONTENTS AND ILLUSTRATIONS.

CONTENTS.

	Page
Editorial	167
Live Stock and Poultry in the Philippine Islands	470
Introduction	470
Horses	476
Cattle	484
Carabaos	487
Swine	488
Goats	489
Sheep	491
Poultry	492

APPENDICES.

APPENDIX 1.—Animal Census by Provinces	495
APPENDIX 2.—Poultry Census by Provinces	496
APPENDIX 3.—Philippine Imports of Animals and Animal Products	497
APPENDIX 4.—Breeds of Milch Cattle and Carabaos for the Philippine Islands, by David G. Fairchild.	501
APPENDIX 5.—Report on Beef Supply of the Philippine Islands	503

ILLUSTRATIONS.

PLATE I. (a) Native Stallion, (b) Native Mare	Frontispiece
	Facing page—
II. (a) Native Stallion; (b) Crossbred Colt	476
III. (a) Native Bull; (b) Native Bull, (c) Imported Chinese Bullock; (d) Crossbred Bull	484
IV. Imported Nellore Cow	486
V. (a) Native Carabao; (b) Imported Indo-China Carabao	488
VI. (a) Native Sheep and Goats, (b) Native Swine	492
VII. Rainfall Map	524

EDITORIAL.

ANIMAL INDUSTRY IN THE PHILIPPINES.

The present number of the REVIEW is devoted entirely to the subject of animal industry in the Philippines. The previous number was devoted to the general subject of forage supply and its production.

During the past ten years a great deal more has been said on the negative side of the live-stock business of the Philippines than on the positive or constructive side. This has been due to the fact that there have existed here to a greater or less extent some of the fatal epizootic animal diseases which have caused some losses among the draft animals and slaughter cattle. A careful study of conditions pertaining to animal life in these Islands indicates that these diseases have not been nearly so severe as they are generally believed to have been. As a matter of fact all classes of live stock in the Philippines, with the exception of horses, have steadily increased in numbers since the American occupation, and it is quite certain that the apparent shortage in animals necessary to supply the local markets has been due rather to an increased demand since the restoration of peace than to a reduction in the animal supply by reason of epizootic diseases.

There is more live stock in the Philippines at the present time than there has been at any previous time since American occupation. During the last decade of the Spanish régime there was a notable increase in the number and size of the herds of cattle. It should be noted, however, that the apparent abundance of animals during this period was largely relative, as wages were much lower and the purchasing power of the people correspondingly small. There is no doubt that the conditions for the actual production of live stock were then more favorable than they are at the present time, as there was less danger of losses from disease, foundation stock was cheaper, and the cost of labor was much less.

Stock raising in the Philippines is, relatively speaking, more profitable now than it was fifteen or twenty years ago, as there are advantages which more than offset the difficulties attending the business at the present time. The many natural advantages which this country enjoys, especially in the large areas of available open land, abundant water supply, and salubrious climate, make it an almost ideal live-stock country. It is one of the few places left in the world where large ranges and correspondingly large herds are still possible. It will probably be from a quarter to half a century before much of the unoccupied land of the Islands will be required for strictly agricultural purposes. In the meantime the most economic use of this domain is to devote it to grazing and forest purposes. There may be some prejudice among stockmen who are accustomed to the larger classes of animals against handling the small Philippine ponies, the Oriental types of cattle, and the ungainly carabao. Persons who hold such opinions would do well to avoid the common error of assuming

that everything to which they have been accustomed at home is better than that which is produced in the Orient. The domestic animals in the Philippines are a product of existing conditions which have acted to create forms of animal life best suited to those conditions. The Philippine pony is the best horse to raise for the Philippine markets. In fact, this pony, considering his size and the conditions under which he has been produced, is one of the best horses in the world. The ponies of these Islands can be greatly improved but this should be done mainly by selection and care rather than by the importation of breeding stock from other countries. If foreign blood is to be introduced there is no doubt that it should be from the same sources which gave origin to the Philippine pony, particularly the Arabian stock.

The same general conditions apply to the improvement of cattle, carabaos, swine, goats, and poultry in these Islands. The most important requirement in our local animal industry at the present time is an increase in the number of hardy, fearless class of settlers who have developed the live-stock industry in the southwestern part of the United States. There is ample room both for the local stock people who may wish to develop their business here and for any others who may desire to engage in stock raising in this country.

It is believed that this number of the REVIEW contains material which should give all interested parties a fairly good understanding of the live-stock business as it exists in the Philippines to-day, as well as the future prospects for this industry.

LIVE STOCK AND POULTRY IN THE PHILIPPINE ISLANDS.

INTRODUCTION.

To the close observer, familiar with conditions under which live stock is produced in the different countries of the world, the many natural advantages of the Philippine Islands over other countries are very noticeable and are constantly magnified as a more perfect knowledge of the Islands is acquired. A country where protracted droughts are not known, where grass grows during twelve months of the year, where running water is nearly always and everywhere abundant, where millions of acres of public domain covered with good grass lie unoccupied and unused, and where artificial shelter is not necessary; such is surely a country of great promise. In addition to the many favorable conditions for the production of animals that make the Islands so alluring to the stock raiser, the present high prices, the large demand, and the indication that the prices will go higher and that the demand will increase, are also factors of great importance. There may be other countries where live stock can be produced as cheaply, but it is very doubtful if in any of these countries there is as good a market as here. At the present time, in most countries where the demand for live stock equals or exceeds the supply, the cost of production is a very material factor; and in many countries where the cost of production is low export trade must be relied upon. While export trade is always satisfactory when once it has been established, stock raising is a very unsatisfactory undertaking in a country where this trade must be relied upon but where it has not yet been well developed. The Philippine Islands offer the most promising situation to the producer in that the country is importing annually live stock and live-stock products to the amount of ₱8,686,512.58 (see Appendix III), and in that there are at present lying idle approximately 36,000 square miles of unoccupied public lands upon which all of these imports could be produced. With the present rate of development the demand for live stock and live-stock products should more than treble during the next ten years.

The great numbers of cattle and horses in the Islands in the early eighties, before the advent of surra and rinderpest, prove that many conditions here are ideal for their production. In fact, paradoxical as it may seem, the ease with which animals could be produced and the rapidity with which they increased, is in a large measure responsible for the small number in existence to-day. Animals all thrive so exceedingly well and increased so rapidly that it had the effect of causing the inhabitants to neglect their herds, in some cases quite to the point of letting them "run wild." Upon the arrival of the contagious diseases, which have so deplorably decimated the herds of the country, the habit of inattention had become so fixed upon the people that practically nothing was done by them to protect their animals. Those who had been spared a few animals still continued to neglect them, regardless of the high prices and the great demand. Others, who have been in the position to acquire herds, have seldom done so, believing that disease is inevitable and that all efforts toward protection would be of no value. Nearly every one who is acquainted with conditions in the Islands will say that the live-stock business affords the best opportunity for investment that we have here, were it not for contagious diseases. In most cases the fear of these is sufficient to cause people to invest their money in other ways.

Though it is true that contagious diseases did destroy a great many animals, it is equally true that during the last few years their presence has done far more damage by keeping people from engaging in the business than it has in the destruction of animals. It may be a surprise to some, and yet it is a fact, that during the last three years the death rate of animals from this cause during any one year has not equalled 2 per cent of the total number. It may be seen by referring to pages 410 and 411 of Volume IV, No. 8, of the PHILIPPINE AGRICULTURAL REVIEW, that animals of all classes are steadily increasing. Yet the fact that the demand is increasing even faster than the supply causes most people who have not particularly investigated conditions to believe that the total number of animals is decreasing rather than increasing. It is a remarkable fact that more animals in the Philippine Islands die each year from neglect than from contagious diseases. The males are very seldom castrated and the herds are often composed of more males than females. The number of new-born animals that are constantly gored and trampled by these males can easily be imagined by any one familiar with live stock.

The selling of the best males and breeding from the poorest, as well as the general inbreeding, has resulted in the deterioration of all classes of animals in the Philippines with the possible exception of carabaos. Their constitution has been impaired and their size has been decreased to the point that their money value is only 30 to 50 per cent of what it should be. The most noticeable characteristic of Philippine animals is their exceeding prolificacy. The percentage of nonbreeding females is always so low as to be really surprising. The young of the native animals are exceedingly vigorous and always live if given a reasonable chance.

Tuberculosis, which is causing so much damage in most countries of the world, is practically unknown among the native animals here. In fact, animals of this country, in comparison with those of other countries, are exceptionally free from diseases. That herds can be protected from the two damaging diseases that are present—*i. e.*, rinderpest and surra—is not only theoretically possible with very little trouble and expense, but has been proven possible through practical experience with many herds in which these diseases have never appeared.

The climate, soil, and vegetation of the Islands are so well described by Mr. H. N. Whitford, Ph. D., forester, chief of division of investigation, in the Bureau of Forestry Bulletin No. 10, Part I, that the following extract is here given:

There is little question that practically the entire land area of the Philippines, from sea level to the highest mountains, was originally covered with unbroken forest growth of some kind. The following represents the present classes of vegetation, with the estimated area of each:

Classes of vegetation	Area (square miles).	Percent- age.
Virgin forests	40,000	33½
Second-growth forests	20,000	16½
Grass lands	48,000	40
Cultivated lands	12,000	10
Total	120,000	100

Put in another way, the land area of the Philippines is about equal to that of the State of New Mexico, while the virgin forest area is approximately equal to the entire area of the State of Kentucky.

GRASS LANDS.

The large grass areas, called cogonales, are covered principally with two species—cogon grass (*Imperata exaltata*) and talahib (*Saccharum spontaneum*). Such areas are known as cogonales. They are mainly the

result of a shifting system of agriculture, which is prevalent throughout the tropics and known in the Philippines as *caiñgin* making.

Cogonales originate in the following manner, and remain as such so long as fires prevail. Usually a small portion of original or second-growth forest is cut during the dry season, the timber and brush are allowed to dry, and are then partially burned. The area thus prepared is planted with rice, sweet potatoes, corn, or other crops.

Cultivation then practically ceases, and the jungle growth, consisting of grass, weeds, and tree species, quickly gains ascendancy over the planted crops, and at the end of the first, second, or third year the *caiñgin* maker abandons his clearing for a new one in another patch of forest. If the jungle growth is set on fire, as is frequently done, nearly all plants except the grasses are killed. In this way through many years vast areas of forest lands have been converted into cogonales, and repeated firings have prevented any change in their vegetation. Abandoned areas, formerly more intensively cultivated, have also become changed to grass lands in the same way. It is surprising how quickly this grass will become dry enough to burn. Three or four rainless days will permit it to burn with sufficient heat to kill nearly all the seedlings of woody species. Grass lands are prevalent on land of nearly all types of topography, from sea level to the tops of the mountains. In the pine region of central and northern Luzon other species of grasses frequently take the place of the cogon, although these grass lands originated in the same way.

The grass lands are a detriment rather than a help to agricultural development. They seem to be the favorite breeding places of grass-hoppers which frequently destroy growing crops. It is very expensive to bring them under successful cultivation, for they form dense masses of roots and underground stems which several plowings will not entirely kill. Many Filipino farmers prefer to prepare for cultivation the land covered by virgin or second-growth forests. Indeed, in some instances they will first plant a grass area with seeds of some small rapid-growing trees, allow them to grow and shade out the grass, then cut and burn the wood, and plant their crops. The cogon grass is so coarse that it can not be considered a good forage crop unless it is kept closely cropped, in which case other grasses better for forage gain a foothold.

SECOND-GROWTH FORESTS.

The 20,000 square miles of second-growth forests in the Islands, like the grass lands, are due in the main to the *caiñgin* system of agriculture. If fires are not started when the *caiñgin* is abandoned, the woody species quickly gain the ascendancy and shade out the little grass that has obtained a foothold. Here, as in temperate regions, certain species of little value enter the freshly deforested regions, giving rise to subtypes of forest known under the Tagalog name of "*calaanan*," the Visayan name of "*late*," and the Moro name of "*boog*." On freshly exposed soil, the first stages of this reforestation process are remarkably similar throughout the Islands. At first, the composition is very simple, being made up principally of the following species: *hamindang* (*Macaranga bicolor*), *binunga* (*Macaranga tanarius*), *hinlaumo* (*Mallotus ricinoides*), *alim* (*Mallotus molluccanus*), and *balanti* (*Homalanthus populaneus*), all belonging to the *Euphorbiaceae*; *anabion* (*Trema amboinensis*), belonging to the

Ulmaceae; and anilao (*Columbia serratifolia*), belonging to the *Tiliaceae*. For small areas, sometimes one, sometimes another, of these trees are found in almost pure stands. This is particularly true of hamindang, binunga, anabion, and balanti. All these trees are capable of producing seeds within a year or two after germination. Some are edible, and are thus quickly scattered by birds and animals; others have fruits adapted to wind distribution. Most of them mature early, are light loving, and are replaced by a more complex stand, composed of shade-enduring species. Ultimately, these second-growth forests may redevelop into forests whose composition is much like that originally destroyed.

In the natural reforestation of the grass lands, another set of species first gains entrance. In the high regions of central and northern Luzon, the Benguet pine (*pinus insularis*) is the pioneer species. In the lowlands among those that first gain entrance are binayuyu (*Antidesma ghacsembilla*), alibangbang (*Bauhinia malabarica*), duhat (*Eugenia jambolana*), acleng-parang (*Albizia procera*), and others. The first two of these are especially able to resist the effect of fires, and thus can occur as scattered trees through the grass lands. When the fires are checked for several years, these trees often form the centers for closed stands, and eventually cover large areas. These subtypes become gradually more and more complex, the rapidity of the process depending on their distance from seed-bearing trees, and of course the composition varies according to the character of the species of the seed-bearing centers. Thus so many subtypes exist that it is difficult to make generalizations. Advance stages in the development of second-growth forests are so mixed with tangles of climbing bamboo and other vines that they are difficult to penetrate. Such forests often cover large areas, and are the so-called jungle growths of the Philippines. They often alternate with patches of grass, with which they make the vegetation known as parang. Forest fires such as exist in drier portions of the tropics and in temperate regions do not exist in the Philippines. Surface fires run through the pine forests, destroying young trees and injuring somewhat the older ones. Outside the pine regions there are practically no forest fires, only "prairie" fires and burnings of timber that has been felled previously. These may injure the edge of the original forests, but do not penetrate them and produce conflagrations such as are known in the coniferous forests of the temperate regions. The parang districts often show kaleidoscopic changes, due to the rapid development of jungle growth where the fires are checked and to the entrance of grass or second-growth forests in newly abandoned cañigins. In the more thickly settled portions of the Islands, and along well-traveled trails, practically all the original forests have disappeared, giving place to grass or second-growth forests. The second-growth forests are seen by the average traveler, and have conveyed the wholly wrong impression that the forests of the Philippines, and, it is believed, of the tropics in general, are a densely overgrown mass of impenetrable jungle. Little is seen of the original forests of the interior, for the jungle growth on its borders tends to discourage efforts to penetrate within. Over one-half (approximately 68,000 square miles) of the area of the Islands is covered with grass or with second-growth forests. The prevention of further destruction of the virgin forest, and the reforestation of the grassy regions on non-agricultural lands, both by the prevention of fires and by planting, are the greatest forestry problems of the Philippine Islands.

VIRGIN FORESTS.

Virgin forests are those which either have been undisturbed by man, or have been so little exploited that their original character has not been materially changed. They form the source from which the inhabitants of the Islands may draw and are drawing their main supplies of timber, and also include the protective forests of the high mountain regions. They cover approximately one-third of the total area of the Islands.

CLIMATE.

The average annual rainfall of the Philippines shows pronounced variations in different parts of the Archipelago, ranging from 900 millimeters (36 inches) to 4,000 millimeters (160 inches). The heaviest rains occur during the summer and autumn months (June to October), which is properly called the rainy season. The entire Islands are well watered during these months. During the winter months (November, December, January and February) the northeast monsoon rains continue to water abundantly the eastern and northern coasts, thus giving the Pacific coasts and the islands bordering the large inland seas a prolonged or second rainy season. The western half of central and northern Luzon, the western coasts of Mindoro and Panay, the Calamianes group, and small areas in other portions of the Islands receive little rainfall from this monsoon, because of intervening mountain masses. Thus a prolonged, comparatively dry season with only occasional showers prevails in these regions for the six months from November to May. In the other portions of the Islands, this dry season varies from two to four months and is more frequently interspersed with showers. In some places the showers are so frequent that there is an entire absence of a dry season. Thus it will be seen that there are two distinct climates, one in which the dry season is long and pronounced and another in which the dry season is shorter and less pronounced and sometimes wanting. In the former region, the forests during this season shed a portion of their leaves, and some trees are even entirely defoliated for a short time; in the latter, the forests are generally evergreen. Though grass areas are found in both, they more quickly establish themselves in the drier belt. It is a general rule that throughout the Islands during the long or short dry seasons the amount of rainfall in local showers, and the relative humidity, is less in the lowlands than in the high altitudes; consequently, the forests of the low altitudes may show a much less evergreen appearance than the forests of higher altitudes of the adjacent interior mountain passes.

The monthly distribution of the rainfall should be considered, because some localities in the regions of a long dry season receive a greater annual rainfall than others in the region of a short dry season. Thus Balanga (Bataan), in the region of the long dry season, has an annual rainfall of 2,394 millimeters, of which 83.5 per cent falls from June to October; 5.3 per cent from November to February; and 11.2 per cent from March to May. On the other hand, Jolo, in the Sulu Archipelago, with no dry season at all, has an annual rainfall of only 1,666.8 millimeters, of which 49.2 per cent falls from June to October; 28.3 per cent from November to February; and 22.5 per cent from March to May.

Although the Philippines have a range of latitude from 4.5° to 22° north, the variation in the temperature is believed not to be great enough to have any pronounced direct effect on the vegetation below 500 to 600 meters in altitude.

TOPOGRAPHY AND SOIL.

As a general rule, the topography of the Islands of the Archipelago consists of interior mountain ranges, with coastal plains of greater or less width. In some cases these ranges are nearer one side of the Islands than the other; in others, large river valleys separate two parallel mountain ranges. The mountains are volcanic in origin. Some isolated volcanic peaks rise abruptly from the surrounding lowlands. Limestone deposits, often crystallized by volcanic action, occur scattered throughout the Islands, especially along the coast. In some portions, large areas of stratified volcanic tuffs exist. These variations in the character of the rock and soils in a measure affect the character of the vegetation. Under a discussion of the forest types, attention will be called to certain pronounced variations due to this cause.

The subject of cattle raising in the Philippines is very well handled and exhaustively treated in the special brief report appearing as Appendix V. While this deals mostly with cattle raising, the production of other classes of live stock depends so much upon the same conditions that this report is of especial interest, not only to prospective cattle raisers, but to any one considering any phase of the live-stock business in the Philippines.

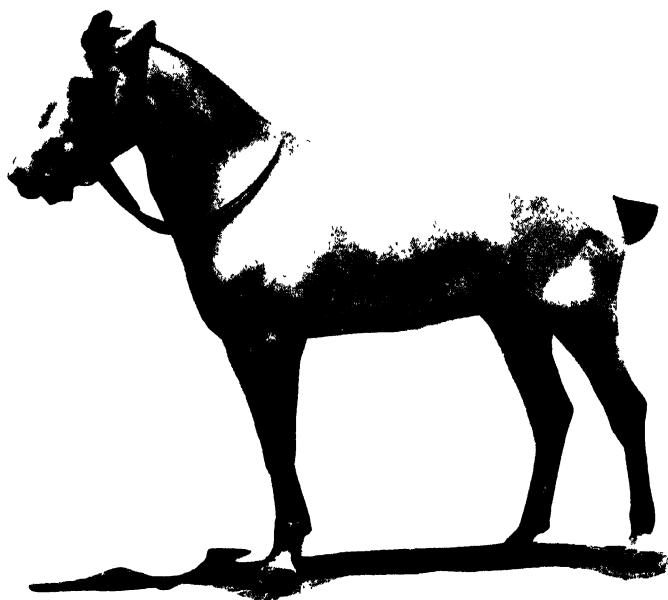
The rainfall map appearing as Plate VII shows the amount and distribution of the rainfall in the different parts of the country.

HORSES.¹

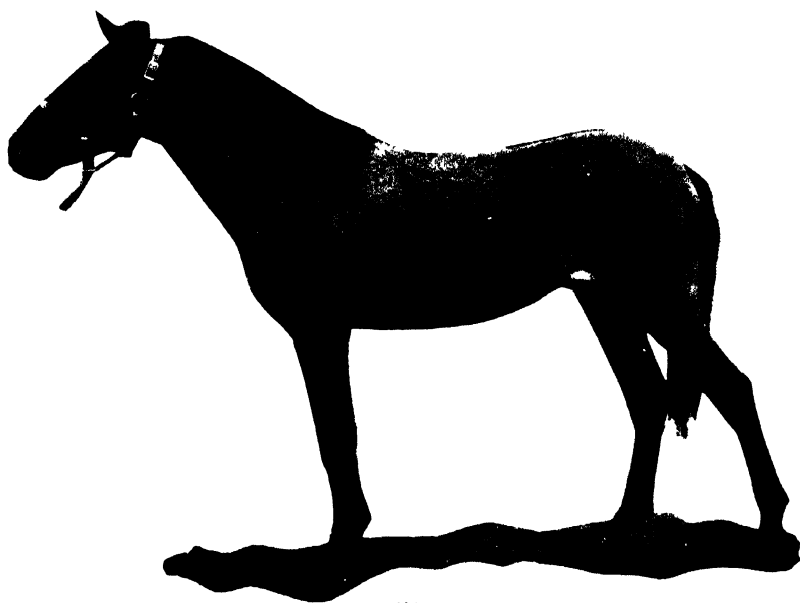
The present-day horse of the Philippine Islands is largely the result of the blending of the blood of the Sulu horse with that of the horses brought into the northern islands by the Spaniards, together with some admixture of Chinese blood. So intimately have these different elements been blended that it is only in occasional individuals that the character of the original stocks can still be traced.

Of these elements the first to be introduced was the Sulu, which was brought into the Sulu Islands from Sumatra, Borneo, and Malakka by the Moros during the middle of the fifteenth century. The ancestry of the Sulu horse is not definitely known, but geological evidence makes it seem probable that the Sulu is an offshoot of one of the East Indian horses, probably of *Equus sivalensis*, a prehistoric horse whose remains are often found in geological formations of the Pliocene period of India. This prehistoric animal was characterized by a preorbital depression, a large development of the first premolars of the upper jaw, and the presence of but seventeen pairs of ribs. These same characters are occasionally found cropping out in the modern Sulu horse,

¹ Valuable notes on the origin of the Philippine horse have been furnished by Mr. D. V. Mackie, agricultural inspector, Bureau of Agriculture.



(a)



(b)

PLATE II (a) NATIVE STALLION (b) CROSSBRED COLT (By Arab sire from native dam. Property of the Bureau of Agriculture.)

though developed to a lesser degree than in the ancestor mentioned. Tracing the ancestry still further back, we find that in the ancient Hipparion the premolars reached their maximum development, and that the preorbital depression is functional, probably containing a scent gland such as is found in the stag. Thus we see appearing in the anatomy of the present horse, by monstrosity, structures which normally existed in the ancestral type.

Some paleontologists believe that the Indian species (*E. sivalensis* and *nomadicus*) became extinct, and that *E. stenonis* gave rise, through *E. robustus*, to the modern breeds. But the presence in the Java, Sulu, and Borneo horses of the above-mentioned vestiges of the preorbital depression and the large premolars, make it appear that some modified descendants of *E. sivalensis* survived, and that that species was the lineal descendant of the Hipparion. Such changes in the dentition as have been referred to could easily have been caused by a change of food supply and environment; *i. e.*, in the forest-inhabiting horses that browsed rather than grazed it would be very natural that these teeth should be larger and more powerful.

The horses found in the northern part of the Archipelago are largely descendants of the horses brought into the Islands by the Spaniards. Most of these imported horses were obtained from Mexico, where they were known as creoles, or mustangs. The greater number of them were recruited from the herds that had existed in a semiwild state in Mexico and the adjacent territory from the time they were introduced into the New World by the early Spanish explorers. These creoles, or mustangs, sprang from the Andalusian horse of southern Spain, which had been liberally mixed with the Germanic race. The foundation stock of the Andalusian horse consisted largely of the Arab and Moor horses left by the Moors upon their expulsion from Spain, and individual animals brought back to Spain by returning crusaders. The exact place of origin of these Arab and Moorish horses is not definitely known, though it is a fact that they were bred pure for over 2,000 years. Some writers contend that the Valley of the Nile was the original home of the breed, but as no Egyptian paintings prior to the invasion of that country by the Hyksos (1700 B. C.) exist, it seems safe to state that the horses were first taken to Egypt by them.

Some authorities hold that the high-caste Arab is akin to the Celtic pony, claiming that the only fundamental difference between the two races, excepting the pelage, is in the ears, which in the Arab are full and incurved at the points.

This Arab stock was freely crossed with Germanic blood, in

order to secure an animal of sufficient weight to carry the heavy armor that was worn at that time by both horse and rider. The history of this crossing of the Spanish horse and its change of racial characteristics may be studied from the fifteenth century paintings of Rizze, Bartolomi, Gonzales, Paret, and Goya in the Museum of Paintings at Madrid. The horses in the paintings of Goya, in such pictures as those of the Duke of Zaragoza and of Charles IV, appear with oval, sheep-like heads. The paintings made during the middle of the eighteenth century also show that the typical Andalusian horse strongly resembled the Germanic stock. It is very probable that Charles V of Germany, who was also King of Spain, had much to do with the introducing of the Germanic stock into Spain. From the above, it will be seen that the Spanish horse had lost much of its pure Barb and Arab blood before its introduction into the Americas, and that the resulting creole horses were of multiple origin.

The Germanic stock used for crossing with the Andalusian horse contained a goodly amount of blood of what is known as the Norse horse. Most of the individuals of the latter race were dun colored with black mane, tail, and feet; the mane was long and heavy and fell to both sides of the neck; there was a dark dorsal, longitudinal stripe connecting the mane with the tail, accompanied by indistinct shorter stripes; distinct bars on the legs especially in the region of the knees and hocks, were generally present; the ears were short and carried in an upright position, and the outline of the face was convex near the muzzle, ending in a somewhat long upper lip. These characteristics of the old Norse horse are sometimes seen cropping out in existing horses of the Philippines. The old German race, which was much younger than the Arab and Barb, and had not been subjected to such rigid selection, was thus a potent factor contributing to the early degeneration and reversion of our native horses to a type resembling their wild ancestors. In the Arab branch, the dun color, so common among Philippine horses, was never present, for during 2,000 years all horses of dun and cream colors were considered worthless and generally killed. Animals of either of these colors were regarded by the Arabs as unfit for anyone but an "infidel" to ride, and hence, by the long-continued practice of destroying such animals, these colors were gradually eliminated.

In addition to the Sulu and Spanish blood used in the formation of the Philippine horse, it is likely that Chinese horses were among the first introduced, and were brought in at different intervals later, though records of such importations are very incomplete.

The different strains entering into the Philippine horse have been so persistently crossed that it is in only a comparatively few individuals that the original distinguishing characteristics can be discerned. The horses of the Sulu Islands, which were much less affected by Spanish importations than those of the northern provinces, retain more of the original ancestral characteristics. They appear slightly coarser in build, with a longer and more massive head and less style, action, and vigor, than the northern stock. In a few individuals the slight preorbital depression, the large first premolars of the upper jaw, and seventeen pairs of ribs occasionally persist.

All evidence seems to point to the fact that the Philippine horse is a rather composite animal, embodying many of the original strains that have been foundation material for several other better known breeds. The native horse has been bred for a sufficient length of time, without addition of outside blood, that they may be said, in the true sense of the word, to be a true breed. While individual variations occur, there are many breed characteristics that are very constant. Probably no other horse in the world has the combined quality of style, action, vigor, and endurance to the degree that this breed has. "Wonderful pieces of horse flesh," is the common expression concerning them. Their endurance can not be realized by one not acquainted with them. A 48-inch horse will carry a 200-pound man 50 miles over a trail or road in ten hours, without suffering, and he can be hitched to a two-wheeled rig and driven the same distance the next day with three men riding, if the roads are fair. It has been a question of the survival of the fittest for decades, with practically no attention being given to their breeding, and to their welfare during life. This has been undoubtedly conducive to stamina and vigor, but it is surprising that the conformation has improved and the size has not been sacrificed to a greater extent. The males are never castrated, and the females are allowed to breed at will regardless of age or season.

The individuals of the breed vary in size from 47 to 54 inches, averaging between 49 and 50 inches. Only about 10 per cent are 50 inches or more and about 2 per cent reach the height of 52 inches. Occasionally individuals are found standing 53 and 54 inches, but these heights are rare. The colors are mainly bay, black, gray, and dun, appearing in frequency in the order named. Very rarely is white found mixed with the other colors, even on the legs and face.

In general appearance they are clean-limbed, smooth of body, and rather upstanding. The head is broad, the face straight, and the ears small and fine. The neck is usually of good length,

small at the throat-latch, noticeably thick through the lower portion, the upper line usually arched, and joined forward and low at the withers, causing in nearly all cases either a depression at the juncture or a comparatively straight line over withers and adjoining portion of the neck. This manner in which the neck joins the body is one of the noticeable characteristics of the breed, tends to give the body a long appearance by lengthening the body top line, and causes the neck often to appear short. The back is usually straight and rather narrow; the loin straight, heavy and broad and well joined to the croup. The croup is often short, drooping and narrow and the tail set low. The body is long, but rather inclined to be narrow and shallow. The feet are of excellent quality, large, well open at the heels and usually "set straight." The fore limbs below the knees are set well in line, are clean, hard, "non-meaty," and with the proper length and slope of pasterns. Often a slight narrowness is in evidence just below the knees, which are large and strong. The forearm is inclined to be small though the arm is sufficiently large and the muscles well developed. The shoulders are large, sloping and well laid to the body, being very well laid in at the top. The posterior limbs are often light and long in the gaskins, "sickle" and "cow-hocked" and often back of the proper position. While the poor hindquarters and withers are constant enough to be breed characters, there are many individuals excellent in one or more of these points, and often individuals are met with the conformation of which leaves little to be desired.

One of the important characteristics of the breed is the universally excellent quality of limbs and feet. Bone affections, such as spavins and ringbones, are seen so seldom that they may be considered almost a negligible quantity. Less than one-tenth of 1 per cent are thus affected. The writer has never seen or heard of a native horse affected with side bones. This absence of limb affections is all the more interesting when it is considered that the horses here are put to much greater strains and more constant, hard, predisposing usage than are the average horses of European and American countries. They are usually ridden and driven from the time they are two years old, and often at a much younger age. In the official races run monthly in Manila the horses are weighted from 100 to 140 pounds. Many run races each month and are in constant training for upwards of six or seven years and leave the track sound. The greater percentage of those that do "break down" or have to be "laid up for a spell" suffer from "tendons." The percentage of native horses working on the streets of Manila that are over 20 years old is probably greater than in any other city of the world.

Considering the weight that they are compelled to carry, and the conditions of the track, the official records made by the native horses on the Manila race track are little short of marvelous. Some of these records are here given:

Records of horses which have run at the San Lazaro race track.

Date.	Owner.	Horse	Distance	Time	Weight	Jockey.
			<i>Miles.</i>	<i>Minutes.</i>	<i>Pounds.</i>	
Apr. 8, 1904	S. Ortiga	Orlando	1	1.48½	143	Ruiz
June 11, 1904	do	do	1½	3.16½	130	Do
June 12, 1904	F. Herrero	Agusan	1	2.01½	90	Manuel
Do	do	Umpara	1½	2.28½	116	Vasallos
Apr. 14, 1906	do	do	½	1.14½	124	Ruiz
Do	do	Sagunto	½	1.31½	121	Felipe.
Do	R. Asunción	Lapulapu	1½	1.39½		
Feb. 11, 1907	M. Cortes	Perla	1½	1.07	110	Cortes
Feb. 22, 1909	do	do	*2½	5.09	121	Do.
Do	J. Flameño	Buster	½	0.58½		
Mar. 26, 1910	F. Herrero	Umpara	1½	2.40	119	Tolentino

*Approximately.

At present horses are used here principally for riding and light driving. Practically no heavy draft work or field labor is performed by them, cattle and carabaos being used for the heavy work. Some packing is done with horses in sections of the country where cart trails or roads do not exist. It is doubtful if the horse will be used for field work, to any extent, during the next half century. They will take the place of cattle and carabaos as draft animals on the roads to a great extent, providing the numbers increase and more large individuals are available.

It is chiefly because the larger native ponies are so difficult to obtain and command so high a price that Australian horses are imported. For most purposes large native horses are considered superior to the Australian, as they wear longer, cost less to keep, are less liable to go lame and are handled better by the Filipino drivers.

Large native horses with good conformation, and evidencing indications of developing speed, are often sold for use on the Manila race track at from ₱1,000 to ₱2,500. A 52-inch horse, well broken to drive and with a goodly amount of speed when hitched, will always be purchased quickly in the larger towns, for driving purposes, at from ₱300 to ₱800, speed and style being the prime requisites. Fair driving animals, 50 to 52 inches, are sold on an average of about ₱200, ordinary ones 49 to 50 inches selling at from ₱80 to ₱150. Prices depend considerably on whether the horses are purchased in the country or after they are in town. Ordinary mares usually sell cheaper than males of the same class. Average specimens can be purchased in the provinces at from ₱50 to ₱125. Exceptionally good mares,

standing 50 inches or better, are much higher and are difficult to obtain at from ₱200 to ₱300. Mestizo colts are much prized by the people and sell readily at from ₱400 to ₱1,000.

It is a deplorable fact that the native horse has deteriorated during the last fifteen years. The reasons and remedies are obvious, but unfortunately this knowledge will have but little effect in the near future toward checking the deterioration of the breed as a whole.

Before surra became prevalent in the Islands, horses were so plentiful in the country districts that many good stallions were left with the mares. During the last few years horses have become so high priced and scarce that all the best ponies are taken up for use before the breeding age. After a male is once taken up and put to work he rarely ever is given the chance to breed. After he becomes old and unfit for work, he is usually slaughtered for meat, or if he is returned to the country, he is generally found to be impotent. Thus at the present time only the most inferior males are with the mares, and it is by these that the present day foals are sired. The castration of all small and otherwise inferior males, and the placing of a few good stallions in each municipality for free public service, would work wonders in the improvement of the breed. However, the prejudice against castration is so strong among the people that it is impossible to castrate more than a very small percentage of those that should not be serving mares.

The Bureau of Agriculture is, and has been maintaining American, Arabian, and large native stallions in the provinces for free public service. By this means a good many fine cross-bred colts are annually foaled, but the males are usually removed to the cities before they have an opportunity to breed and thus only the mares are left to continue the work of improvement. The Bureau has found it very difficult to secure desirable horses for this provincial breeding work and is now raising its own supply. Native mares are bred to Arabian stallions, and American and native mares to Arabian and native stallions; from these crosses are being obtained some fine stallions of the proper size and conformation for the purpose desired. Some of these are sold each year and are eagerly sought for by people who desire good stallions, but who do not care to risk ordering them from foreign countries, and who also realize that those raised here are in many ways superior.

The importance of improving the native horse by selection can not be overestimated. The Bureau is doing some important work along this line. The largest and best native mares ob-

tainable are being crossed with large native stallions of good conformation, the mares being between 51 and 52 inches in height and the stallions 54 inches. It is believed that with good care offspring of the first cross will average 53 inches; and in five or six generations a strain should be developed, many of the individuals of which will measure 56 inches in height. Though it is realized that it will take longer to increase the size of the breed by mere selection than it will by the introduction of outside blood, there is no question but that the strain produced by breeding the native horse pure, if the size can be increased sufficiently, will be in most ways vastly superior to those built up by out-crosses of foreign blood. It is quite safe to say that if 56-inch native horses ever become easily available here the importations of horses will drop 90 per cent.

No breed of horses has yet been imported in the Philippine Islands that will thrive on the feed, care, and work given the native horse by the people. The people may be educated in time to take better care of their live stock, but from present indications it will be a slow process. Then also if a native horse can be produced at less cost than one of foreign blood, or a grade, and will command as much money at maturity, where is the advantage of using the outside blood? Notwithstanding what may be said to the contrary, the Bureau has had ample proof that cross-bred horses can not be reared as cheaply, or under the same conditions as the pure native horse.

In spite of what has been said above regarding the pure native horse, people contemplating going into horse breeding at the present time are advised to use foreign males, as their mares will necessarily be small, and there is at present no strain of large native horses the individuals of which will breed even approximately true to size. The extra care that the cross-bred colts will require over that necessary for pure native stock will be more than repaid by the difference in value between the grade colt and the ordinary native animals.

Mule breeding has never been very strongly encouraged by the Bureau, because of the fact that the country needs breeding animals. The Bureau in the past had a few large jacks, and enough mules were produced to prove that the native mare bred to a large jack will produce a very satisfactory mule. With the increase in sugar planting there is sure to be a greater demand for mules, and the breeding of these animals will manifestly be a paying proposition. The present prices of imported stock vary from about ₱325 for the Chinese to ₱600 for the American mules.

CATTLE.

Cattle are found in nearly all parts of the Islands and, like many of the other animals, their origin can be traced back to the advent of the Spaniards and of the Chinese. Naturally then, two distinct types are easily recognized: one in which the Chinese blood seems to predominate, the other in which the principal characteristics indicate their Spanish origin. The former is represented by the red cattle of Luzon and Mindoro and the latter by the black, or black and white cattle of the islands north of Luzon. Those of Chinese origin are more widely distributed than those from Spanish stock. Among these Chinese cattle are two types: those of Mindoro, which are up-standing, rangy, and thin throughout the body, and those of central and southern Luzon, which have a more compact, symmetrical body placed upon well-set, short legs. These cattle are well adapted to the country, and are seemingly better rustlers than are those of Spanish origin, which are found generally distributed in northern Luzon and in the islands to the north.

The larger individuals of the native type make good work animals and many of them are used for that purpose. The remainder of the total number of cattle in the Philippines is composed, with the exception of a few pure-bred animals, of work bullocks imported from China and Indo China. About 4,000 of these are distributed throughout the various provinces annually.

There are in the Philippines very few herds that receive more than the most meager attention. In Mindanao, Mindoro, Leyte, Batan Islands, Babuyan Islands, and Marinduque a few large droves exist. About 90 per cent of the cattle are found in herds of 50 or less, 8 per cent in herds of 500 or under, and 2 per cent in herds of 2,000 or more. The larger groups, as a rule, contain nearly as many scrub bulls as females, due to the fact that castration is not usually practiced and the different classes are never separated, consequently the average herd presents a sorry spectacle. The cattle of these large herds are very wild, and as they are never worked, and as no fences are used, it is a difficult undertaking to capture them for shipment to market.

The cattle produced in these large groups are in most cases the smallest in the Islands and are used principally for beef. The animals used for draft purposes are usually produced by people having only a very few cows. These cows in most cases show evidence of a goodly amount of Chinese blood. The better bullocks of this class weigh from 600 to 800 pounds, and sell at from ₱80 to ₱120 each. The cattle from the larger herds are



(a)



(b)



(c)



(d)

P. 416. III. (a) NATIVE FULL (Chinese blood predominating) (b) NATIVE BULL (Spanish blood predominating) (c) IMPORTED CHINESE BULLOCK (d) CROSSBRED FULL (Galloway-native)

usually quite light, weighing only about 450 pounds and sell for meat at about ₱50 each. The reason for the small size of these cattle is not lack of feed, but the fact that no fresh blood has been introduced in most of the herds during the last fifteen years. The practice of allowing all the males to remain entire and run with the cows and calves is not only responsible for the present small size of the individuals, but is also responsible for the death of many heifers and new-born calves. Contrary to what might be expected, the inbreeding and degeneracy has not resulted in sterility. Native cows are very prolific, and the calves are strong, and if not killed by the bulls, usually live.

The price of fresh beef in Manila averages about 17 centavos (8½ cents gold) per pound, when purchased by the quarter or carcass. In other parts of the Islands, where imported cattle do not compete, the price is usually higher.

There are at present about 248,398 cattle in the country. (See Appendix I.) Probably not more than 100,000 of these are females.

A number of breeds of cattle have been imported by the Bureau of Agriculture from time to time, and various experiments have been conducted with a view to improving the native stock. American Herefords, Shorthorns, and Jerseys were first introduced; sufficient experiments were conducted to prove that these pure-bred European cattle will not survive under present range conditions. The experience of all importers of pure-bred American or Australian cattle confirms this conclusion. On the other hand, a number of breeds have proven very valuable as a factor in upgrading the native stock by the infusion of foreign pure blood. Among these, Angus and Galloways, when crossed upon native and Chinese cows, produced "mestizos" which have proved very satisfactory. These grades are, as a rule, hornless and much larger than the cows; are generally solid black in color, possess much better beef conformation, and seem to be as good rustlers as the common stock. To what extent this upgrading can be carried on and still retain the last mentioned quality has not, as yet, been determined. We would expect the Galloway grades to be slightly better rustlers than the Angus crosses, but on the other hand, they have longer hair and are consequently troubled more by the ticks. Shorthorn and Hereford grades have not yet been sufficiently tested to warrant any conclusion regarding them.

Nellore cattle were introduced by the Bureau in 1909. They have been successfully raised, pure, at Alabang and La Carlota. At Baguio they do not seem to thrive as well as in the lowlands, owing, perhaps, to the cold rains.

A number of pure breeds and grades of this breed have been sold by the Bureau, and most of these have given very good satisfaction as work animals, owing to their size and general energetic disposition. Nellore bulls have been crossed upon Chinese and native dams with very gratifying results. The resulting grades are of good size and conformation, and seem to be able to subsist on the natural pastures of the Islands. The fact that these Nellore cattle are seldom troubled by ticks, that they are very resistant to rinderpest, and that this resistance is transmitted to their offspring, should be important factors in recommending them for this country.

The problem of securing fresh dairy products is a very important one to those living in the tropics. Practically the only dairies in the Archipelago are found in Manila and here there are no extensive plants. The supply of dairy products does not begin to meet the general demand. The dairy cattle consist of grade Shorthorns and grade Ayrshires. Dairying is one of the most promising industries in the Philippines, and it seems strange that more people have not entered this field of investment. At present fresh milk is selling in Manila for 20 centavos per *chupa*,¹ or 53 centavos per liter.

Two breeds of tropical cattle which should prove profitable for the Philippine dairies are the Montgomery and the Sind. The former, known as Sohwal or Teli breed, are found in Ganji Bar in the Montgomery district. They are considered to be the best milch cattle of India, good animals giving 30 pounds daily. In color they are red, pure white, gray, or spotted. They are medium-sized, shapely, short-legged, have short horns and clean-cut heads. The Sind or Husi cattle are second only to the Montgomerys in point of value as dairy cattle in India. They are red, with occasional white color-markings, of medium size, with long deep bodies, short legs and long level quarters. Average cows of this breed give 20 pounds of milk daily.

These two Indian breeds of milch cattle are raised by nomad tribes, who give them the best of care, feed them well, and practice selection, keeping only the best bulls for breeding purposes. Specimens of this breed may be purchased through the director general of Agriculture of India at Poona. On the Indian market a cow sells for from ₱40 to ₱75.

In no other country in the world are so great opportunities offered for beef-cattle raising as in the Philippines. There are any number of isolated tracts of land, well watered and with an abundance of pasturage, that may be purchased or

¹ 875 cubic centimeters.



PLATE IV. IMPORTED NELLORE COW
(Property of the Bureau of Agriculture.)

leased at reasonable rates. Each year there are imported into the Islands more than 40,000 head of beef cattle, also ₱5,184,519 worth of canned and cold storage beef. The most rational method of laying the foundation of a herd of beef cattle is to cross native, Chinese, or Indo-Chinese cows with imported bulls of some of the recognized beef breeds, such as Hereford, Galloway, Angus, or Nellore. For the beef-raising industry the stockman must have cattle that will subsist upon the native pastures. The red cattle which come from Hongkong are better adapted to the conditions here than are the native cattle themselves. They are of good beef conformation, compact and symmetrical, the only objection to them being their lack of size. If a sufficient supply of cows of this type could be secured they would undoubtedly prove good animals to use for a foundation herd.

Appendix V takes up the question of beef production in an exhaustive manner. The reader's attention is invited to this report.

CARABAOS.

The carabao is the most important domestic animal in the Philippines. Upon these animals the agriculture of the Islands is largely dependant, probably more than 90 per cent of the draft work, of all kinds, being performed by them. They are used in preparing the land for planting, in cultivation, and in transporting the crops to market. The carabao cart is the only conveyance for thousands of families. The milk, which is of good quality, is used by the Filipinos practically to the exclusion of all other kinds. After their usefulness as draft animals has passed they are slaughtered, the meat used for food, and the hides made into leather.

There are in the Islands more than 713,121 carabaos. (See Appendix I.) The numbers are increasing, but not in proportion to the demand. About 10,000 are imported annually from Indo-China.

A good many cattle are used, especially for road work and for sugar-cane cultivation. That the carabaos are inferior to cattle, for most lines of work, is the opinion of many. However, the prejudice in favor of the carabao is so strong with the laboring class, that they usually prefer these animals. The carabao is treated better and given more attention than any other class of domestic animals in the Islands.

The great advantage that the carabao has over the other draft animals is his ability to work easily in mud, where cattle would be of little value and a horse would be useless. This trait is of

great importance in this country, as most of the rice is planted in paddies during the rainy season, and the land is prepared in a semiliquid state. For this work the carabao is the only animal in existence that is at all satisfactory. The greater strength of the carabao enables him to haul larger loads than would be possible with cattle—an important advantage, as both cattle and carabaos are usually worked singly with a man in charge of each animal.

In the absence of mud, carabaos are inferior to cattle as draft animals; they are much slower, are unable to work as long at a time, can not perform labor in the sun as well, are more susceptible to disease and do not increase as rapidly.

The native carabaos are much the same in all parts of the country and are all draft animals, there being no milking strains among them, as in India. The local animal is smaller than those imported from Indo China, but is superior for work purposes, being hardier, stronger and more willing.

Prices vary greatly; conformation, disposition, strength and willingness to work are the determining factors. For good, mature, but young animals ₱125 is probably an average price. However, many sell for from ₱135 to ₱200 each.

Though carabaos do not breed as rapidly as cattle, the period of gestation being longer and the dam usually not breeding until the calf is weaned, still they increase rapidly with but little mortality among the calves. As with other classes of stock, no care is given to the breeding or the improvement of these important animals by most of the people raising them. Though the Philippine carabaos will compare favorably with those of other countries, much could be done toward their improvement by selection.

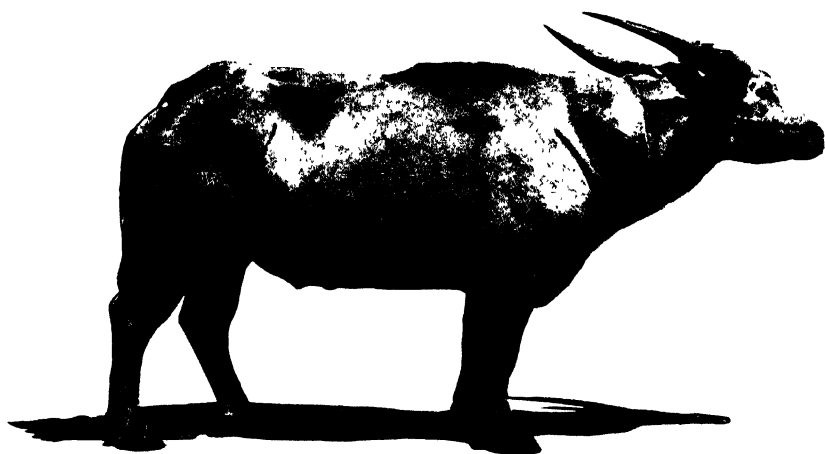
Appendix IV is an interesting article by David G. Fairchild on "Breeds of Milch Cattle and Carabaos for the Philippine Islands," and should be read by those interested in the subject of dairies.

SWINE.

In point of numbers swine hold first place in the Philippines. There are over 2,000,000 scattered throughout all parts of the country. (See Appendix I.) They are the scavengers of the country, due to the fact that they are seldom if ever confined and are compelled to forage for most of their feed. No one person keeps any considerable number, usually but one breeding female being kept by a family. The great majority of the population of the Islands are dependent upon the pig for their meat supply.



(a)



(b)

PLATE V (a) NATIVE CARABAO (b) IMPORTED INDO CHINESE CARABAO

There is always a good market in all parts of the country, both for local consumption and for shipment to the larger towns. Mature animals sell for about 25 centavos per kilo, live weight, and dressed carcasses bring in Manila from 30 to 40 centavos per kilo. Many pigs weighing from 10 to 50 kilos are slaughtered as "lechones." These are stuffed and roasted whole over an open fire. Pigs for this purpose bring excellent prices.

The importation of swine products amounts to over ₱1,000,000 per year (see Appendix I), all of which products could easily be produced locally.

The Philippines offer exceptional inducements for the production of swine and for the manufacturing of swine products. Roots and forage suitable for swine feeding can be grown very easily and with comparatively little cost.

Native swine are wonderfully hardy and prolific; the average number of pigs to a litter is larger than in the case of improved breeds; the pigs are usually very strong and the percentage that live is high; the sows are good mothers, rearing large litters well on very little feed.

The conformation of the native pig is very poor—they are long-nosed, narrow-bodied and flat-sided; however, they respond well to feeding, and may be finished into fairly good killing shape.

The Bureau has for several years been raising and distributing pure-bred Berkshire swine for crossing on those of the native breed. The pigs obtained from this cross are exceedingly satisfactory, strongly favoring the Berkshire parent in conformation and hardiness, and showing but little diminishment of the rustling qualities inherited from the native pig. The Berkshire characters persist for a surprising number of generations of crossing with the pure native stock.

GOATS.

The total number of goats in the Archipelago is estimated at 407,087. (For number by provinces see Appendix I.) They are much more generally distributed than are sheep, nearly every barrio, in fact, claiming at least a small flock. As is the case with most of the native animals, almost no care is given them; they are allowed to roam about the barrio, and increase year by year by natural selection, as few males are ever castrated. No particular breeds or uniform types are represented among these bands, which present specimens varying widely in color and conformation. But in spite of these conditions a number of individuals are to be found which in size and conformation are far superior to what one would naturally expect.

The goat can be, and is put to a variety of uses, here as elsewhere. In a few districts the large bucks are used in a limited way for draft purposes, when other draft animals are scarce. The meat, which will compare favorably with mutton, is a very common article of diet in some localities, though in other sections it is only occasionally eaten. The milk of the goat is sometimes used by the Filipinos though not nearly so generally as among other Oriental people, or as it should be among the Filipinos.

Milch goats possess many qualities that should strongly recommend them to the average Filipino farmer. The fact that they are both grazers and browsers, and exceptionally hardy, places them among the most economical domestic animals. There is a sufficient quantity of waste feed in most barrios to enable each farmer to keep a small flock, and the initial cost of breeding stock would be practically his only expense. In many oriental countries and in Europe, where it has proved to be particularly adapted to the needs of the poorer classes, the milch goat takes a prominent place in the live-stock industry. In Germany 75 per cent of the households keep these animals.

The milk of the goat is superior to that of the cow and carabao, and is produced much more economically. It has a higher content of albumin and butter fat, and to it medicinal properties are generally attributed. In proportion to body weight, the yield of milk from the goat is much larger than that from the cow. A mature milch goat will yield from 2 to 5 quarts per day, while many individuals of the Nubian breed give 6 or more.

The breeds of milch goats are as numerous and varied as the climates and localities in which they are found. Spanish and Maltese goats have been introduced by the Bureau of Agriculture, and maintained for some time at the various stations. When given plenty of range they seemed to do very well, but when confined too long in small runs they became infected with parasitic diseases. Maltese bucks can be purchased for from ₱36 to ₱50, and Spanish from ₱20 to ₱40.

Other tropical breeds which should prove suitable to this country are, the Nile or Egyptian, Syrian, Malaga, East Indian, etc. Of these, the Syrian can be purchased for from ₱12 to ₱20.

Angora goats, although they give milk of superior quality, are not particularly noted as dairy animals, but are grown more for their fleece and mutton. To date no attempt has been made to raise this breed of goats anywhere in the Islands, other than in the Province of Benguet, but as they are able to adapt them-

selves to great extremes of temperature, and as they are grown in various tropical countries, it is only reasonable to suppose that they could be grown here very successfully.

When raised upon a commercial basis Angoras prove very profitable. Their flesh is exceedingly delicate and nutritious, resembling that of sheep more nearly than do other breeds. Their fleece, called "mohair," furnishes material for some of the finest ladies' garments and is used in various other manufactured goods. The skins are tanned and used as leather, and the pelts make fine rugs. A well-bred goat shears from 4 to 9 pounds of mohair. The world's mohair market is Bradford, England, where practically the entire product of Turkey is sold. New York City is the principal market for that produced in the United States.

It would seem to be a feasible plan for the Filipino farmers of a barrio to cooperate in the purchase of one or more good bucks of one of the best milch breeds, for the purpose of upgrading their native goats. If properly cared for, a buck will serve fifty does, and the latter will breed twice a year. The bucks should run with the flock only during mating time. To obviate the danger of inbreeding, near-by barrios might exchange bucks from time to time. The young mestizo males should be castrated and sold for meat; the cull does should be disposed of through the same channels, reserving only the best females for breeding stock. If this plan were adopted, each barrio could, within a short time, possess a flock of milch goats nearly equal to pure breeds.

In Manila, where there are so few dairy cattle, and fresh milk is so difficult to obtain, goat dairies should be a paying proposition.

Native females can be purchased at from ₱3 to ₱5 each, depending on size, and whether pregnant or not. The Bureau of Agriculture furnishes pure-bred Maltese or Spanish males at ₱20 each, and grades of the same breeds at ₱10 each.

SHEEP.

Sheep are not found to any great extent in the Philippine Islands, the total number according to recent data being 88,760. There are no large ranches, and nowhere is the industry conducted on a commercial basis, though in nearly every municipality a few native sheep are to be found running at large. (For numbers by provinces see Appendix I.)

The native sheep, probably introduced from Spain, are hornless, and of a coarse-wool variety. Owing, however, to the fact that no attention has ever been paid to breeding, or care taken in

the management of the flocks, no pure breeds or uniform types are to be found among them. These sheep are allowed to roam about the barrios at will, no attention being given them, not even shearing. No use whatever is made of them, except that occasionally one is killed for mutton.

Sheep of the Shropshire breed seem to do well in this country, as has been demonstrated by the Bureau of Agriculture. A small flock was successfully maintained for some time at the Trinidad stock farm, which has an altitude of 1,500 meters, also at La Carlota, Occidental Negros, at nearly sea level, and at Alabang, Rizal Province.

Two strictly tropical breeds, both of which might prove valuable in this country, are the Barbados and the Tunis. The former, or woolless sheep, are raised in the West Indies. They are strictly a mutton animal, having no wool, the body being covered with coarse hair. They are hardy, produce an excellent quality of mutton, and are particularly adapted to the tropics. The Tunis (fat-tailed or Barbary sheep) have proven very successful in Africa and parts of South America. They produce a clip of good quality and their mutton is said to compare favorably with that of other breeds.

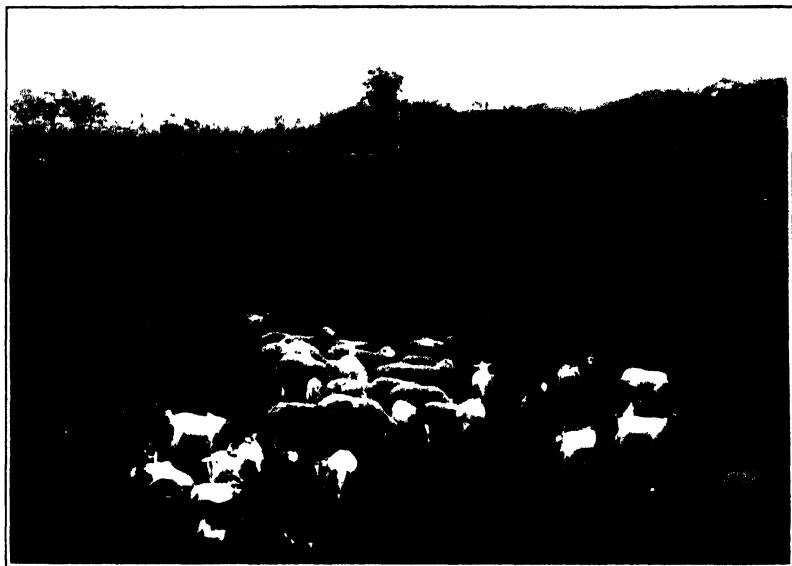
In certain sections of tropical Australia, South America, and Africa, where conditions are no more favorable than here in the Philippines, sheep raising is an important industry.

Each year there is imported into these Islands ₱151,396.80 worth of mutton, all of which could be produced locally, and an export trade in wool could be built up. There are large tracts of well-watered grazing land, and cheap sheds are all that is necessary in the line of buildings. Parasitic diseases seem to be the only serious sheep affliction at present, and these are not a serious menace, provided the animals are given plenty of range.

In establishing a flock the best course, perhaps, would be to select good healthy native females and cross them with imported rams, and then, by selection and breeding, build up a strain adapted to the tropical environment.

POULTRY.

Although chickens are found very generally distributed throughout the Philippine Islands, poultry raising, on a commercial scale, is nowhere carried on to any considerable extent. The latest available statistics (see Appendix II) place the number of chickens in the Islands at 5,420,981, valued at ₱2,561,764. These are not found in large flocks, but nearly every family is



(a)



(b)

PLATE VI (a) NATIVE SHEEP AND GOATS (b) NATIVE SWINE

the possessor of a few fowls. Cockfighting is the natural sport of the people and the average Filipino places a higher valuation upon his game bird than upon either hens or eggs, although both of the latter are important articles of diet. Practically no care or attention is given to poultry raising, except for the production of promising game cocks, which are well fed and pampered while the hens are compelled to forage for themselves. The results of these haphazard methods are what might be expected—birds of ill conformation, with tough, poorly-flavored meat, and laying but few and small eggs.

Turkeys, ducks, and geese are not commonly grown in this country. One of the few localities where ducks are raised in large numbers is the town of Pateros, Province of Rizal. Here duck raising is the principal industry of the inhabitants, who have constructed quite a complete system of houses and yards. The eggs are hatched artificially by placing them between bags of heated rice-husks. The many thousands of ducks raised and sold from here each year afford considerable profit to the growers.

Except in Manila and a very few provincial towns, no pure-bred fowls are raised in the Islands. A number of flocks of pure-bred fowls are being grown in Manila, but the work is conducted by most of the breeders only as a hobby or side issue. No extensive plants are to be found. Some eighteen or more breeds and varieties have been, or are being, successfully raised on a small scale. Of these the Leghorns, Plymouth Rocks, Wyandottes and Brahmas seem to be the most popular.

The Philippines present to the poultry raiser many advantages not found in the countries of the temperate zone: an abundance of green feed and grain can be grown at all times, and the temperature is nearly uniform throughout the year. The cost of buildings is much less than in other climates, since there are no cold winters to guard against. All that is necessary is to provide shade and protection against the rains. Owing to the humidity of the atmosphere and the uniformity of the temperature, incubation can be here used more successfully, and with less difficulty, than in temperate climates.

At present, pure-bred fowls, as well as eggs from same, command very fancy prices in Manila, owing to the fact that the demand for breeding stock and settings of eggs from pure-bred birds exceeds the supply. First-class cocks bring from ₱10 to ₱30 each and hens sell for from ₱5 to ₱20. When it is remembered that more than ₱500,000 worth of eggs (see Appendix III) are imported into the Islands annually, and that

selected eggs from native chickens retail for seventy centavos per dozen, there can be little doubt that poultry raising could be made a profitable undertaking. A number of well-drained sites, protected from winds, within or close to Manila, can be purchased or leased at reasonable rates. A sufficient quantity of eggs and breeding stock of any of the popular breeds may be purchased in Manila. Most of the failures have been due to lack of experience rather than to poultry diseases, for the latter are no more prevalent here than in many of the poultry sections of the United States.

One plan of securing foundation stock for a flock to be grown in the Philippines, on a commercial scale, is to secure good healthy native hens and cross them with pure-bred cocks, using the eggs from these hens for the first hatchings, and then disposing of the native hens. The resulting "mestizos" or hybrids, would constitute the laying and breeding flock. Such a plan is less expensive than commencing with all pure-bred stock, and many breeders claim that the "mestizos" are more resistant to disease than the pure breeds. On the other hand, many trials and no little time would undoubtedly be required to produce by this means a bird having either the egg laying ability of the White Leghorn, or the meat conformation of the Plymouth Rock. Also, it is a question whether the "mestizo" would be more resistant to disease than the properly cared for pure-bred bird.

Of course, engaging in the business upon a commercial scale is a very different proposition from keeping a few birds as a hobby or pastime, but there is no good reason why any investor, equipped with capital and experience, could not make poultry raising in the Philippines a profitable business venture.

It is difficult to understand why the average Filipino farmer does not give more attention to poultry raising. In the provinces there is always a ready market for eggs at from 2 to 4 centavos each, and for poultry at from 30 centavos to ₱1. A nipa shed 4 by 8 meters would accommodate fifty chickens, and the entire cost of shed, bamboo fence for runs, basket nests, bamboo feed troughs, etc., would be very nominal, and a small, well-cared-for flock would add materially to the profits of the farmer.

Within the last year there seems to have been a general awakening among many of the residents of Manila to the opportunities in the poultry industry. With the advancement of the Philippines along the various lines of agriculture, poultry raising is bound to become one of the important industries of the country.

APPENDIXES.

Appendix I.

Number of horses, cattle, carabaos, hogs, goats, and sheep in the Philippine Islands by provinces at the beginning of the fiscal year 1911.

[Compiled by the Statistical Division, Bureau of Agriculture.]

Province	Horses	Cattle	Carabaos	Hogs	Goats	Sheep
Agusan.....	202	327	801	4,885	373	30
Albay.....	4,251	1,133	8,191	50,208	12,082	247
Ambos Camarines.....	495	1,218	12,305	34,527	21,681	1,153
Antique.....	270	5,532	13,842	28,254	6,326	586
Bataan.....	194	266	5,895	7,417	1,725	635
Batanes.....	19	5,358	1	2,500	991	229
Batangas.....	20,088	33,797	12,689	87,110	10,743	255
Bohol.....	2,351	8,023	25,384	520,153	4,675	276
Bulacan.....	2,651	1,342	30,765	59,278	6,674	717
Cagayan.....	7,008	10,784	29,206	26,162	5,660	2,090
Capiz.....	1,886	8,908	28,733	43,639	39,987	1,846
Cavite.....	4,605	3,245	8,672	34,052	1,761	189
Cebu.....	90,903	11,428	29,839	263,440	49,235	6,198
Ilocos Norte.....	11,916	6,938	35,532	37,708	12,054	5,996
Ilocos Sur.....	9,770	13,300	40,889	70,704	25,154	6,040
Iloilo.....	1,383	8,002	36,666	86,717	24,447	7,808
Isabela.....	3,734	2,246	21,756	14,822	2,389	1,119
La Laguna.....	6,169	1,715	12,873	24,303	3,681	204
La Union.....	1,826	3,703	18,054	18,739	13,988	3,079
Letete.....	3,035	7,070	20,645	39,736	13,155	2,162
Mindoro.....	2,755	13,381	5,211	6,880	1,815	...
Misamis.....	2,787	1,239	5,858	23,077	3,045	1,173
Moro.....	3,897	15,435	10,263	17,738	4,915	507
Mountain.....	3,024	14,628	11,393	24,718	4,525	1,787
Nueva Ecija.....	718	2,998	28,315	57,333	5,428	1,034
Nueva Vizcaya.....	489	640	4,230	5,366	730	94
Occidental Negros.....	1,516	10,769	31,384	45,615	25,065	22,032
Oriental Negros.....	4,660	3,821	11,871	37,136	20,060	3,580
Palawan.....	197	8,738	4,810	3,028	498	21
Pampanga.....	2,628	1,389	30,019	49,471	19,010	4,581
Pangasinan.....	3,779	12,168	68,129	100,310	20,159	2,118
Rizal.....	1,669	799	12,928	19,369	2,500	185
Samar.....	1,102	1,249	6,511	25,211	3,693	218
Sorsogon.....	3,166	5,981	10,541	36,210	7,357	813
Surigao.....	1,842	524	8,171	24,762	2,508	182
Tarlac.....	1,012	1,320	28,428	58,961	18,469	7,830
Tayabas.....	6,214	8,858	18,165	35,815	5,866	91
Zambales.....	1,133	3,886	12,040	20,800	2,363	1,649
Total.....	215,674	242,398	713,121	2,066,605	407,087	88,760

NOTE.—It is estimated that about 10 per cent should be added to the above figures, as not all municipalities reported; and it is believed that some of the reports received included only the registered animals.

Appendix II.

Number of chickens, turkeys, ducks, and geese in the Philippine Islands by provinces, 1903.

[From the "Census of the Philippine Islands, 1903."]

Province or comandancia	Chickens.	Turkeys.	Ducks.	Geese
Philippine Islands	5,470,981	9,201	78,215	6,202
Abra	35,352	3	179	1
Albay	85,378	69	310	146
Ambos Camarines	130,650	62	681	234
Antique	59,990	17	119	37
Basilan	955	8	20	10
Bataan	27,807	8	229	1
Batangas	195,942	10	154	32
Benguet	1,382	—	6	2
Bohol	176,798	9	200	45
Bulacan	275,928	1,349	13,667	203
Cagayan	142,161	65	789	127
Capiz	123,624	61	1,867	70
Cavite	121,555	27	528	39
Cebu	618,287	652	927	224
Cotabato	1,425	4	5	7
Dapitan	5,279	—	111	—
Davao	9,002	—	49	14
Ilocos Norte	162,617	6	1,341	85
Ilocos Sur	130,869	21	578	42
Iloilo	211,829	757	2,812	463
Isabela	77,757	36	281	112
Jolo	13	—	—	2
La Laguna	125,354	580	853	105
La Union	91,510	13	203	101
Lepanto-Bontoc	2,258	—	20	—
Leyte	275,680	69	1,072	85
Manila, City	51,581	994	2,148	580
Masbate	26,331	37	69	21
Mindoro	12,387	—	56	21
Misamis	97,545	34	583	34
Occidental Negros	180,929	1,030	4,551	931
Oriental Negros	140,372	60	77	33
Nueva Ecija	177,887	28	2,304	243
Nueva Vizcaya	16,193	7	61	168
Pampanga	280,300	1,011	10,780	238
Pangasinan	198,794	173	5,087	901
Paragua	23,202	7	27	24
Paragua Sur	1,743	—	4	17
Rizal	120,474	1,603	22,290	129
Romblon	40,735	7	254	21
Samar	96,021	24	320	10
Siasi	62	—	7	—
Sorsogon	65,558	40	344	61
Surigao	44,814	11	395	6
Tarlac	261,483	230	1,398	454
Tayabas	142,225	56	469	39
Zambales	93,435	20	180	25
Zamboanga	10,018	3	364	59

Appendix III.

Statement of imports into the Philippine Islands, of animals and animal products, for the year ending June 30, 1910.

[From the Annual Report of the Insular Collector of Customs]

Imports.	Quantity.	Total	Value.	Total
Cattle.	<i>Number</i>			
China	19,167		P 998,302	
British East Indies	609		31,216	
Dutch East Indies	1		76	
French East Indies	23,996		681,111	
British Australasia	527		33,224	
		44,300		P 1,743,932
Horses.	<i>Number</i>			
France	4		6,170	
China	18		1,312	
British East Indies	9		3,031	
French East Indies	66		1,600	
All other countries and ports in Asia	5		1,200	
British Australasia	459		96,470	
		561		109,792
Mules.	<i>Number.</i>			
China	35		6,956	
British East Indies	1		100	
		36		7,056
Hogs.	<i>Number.</i>			
Spain	1		2	
China	40		550	
French East Indies	10		46	
British Australasia	10		536	
		61		1,134
Sheep.	<i>Number</i>			
China	21		206	
British Australasia	14		60	
		35		266
All other animals.	<i>Number</i>			
United States	27		222	
United Kingdom	4		136	
Italy	2		10	
Spain	128		410	
China	3,558		3,578	
Singapore	5		16	
All other British East Indies	133		1,112	
French East Indies	377		114	
Hongkong	178		366	
Japan	267		496	
British Australasia	320		2,731	
		4,994		9,494
Total		49,987		1,871,674
Bones, hoofs, horns, etc.				
United States			4,812	
United Kingdom			12,638	
Austria-Hungary			30	
Belgium			10,366	
France			10,092	
Germany			10,128	
Italy			4	
Spain			3,972	
Switzerland			10	
China			3,456	
All other British East Indies			256	
Dutch East Indies			28	
French East Indies			20	
Hongkong			10	
Japan			7,160	
Siam			331	
Hawaiian Islands			10	
				63,586
Eggs:				
China			561,574	
Japan			38	
				561,612
Forward				625,198

Statement of imports into the Philippine Islands, of animals and animal products, for the year ending June 30, 1910—Continued.

Imports.	Quantity.	Total	Value.	Total.
Brought forward.....				P 625, 198
Hides and skins:				
United States.....			P 172	
United Kingdom.....			14	
Germany.....			38	
Spain.....			8, 110	
China.....			72, 924	
British East Indies.....			74	
Hongkong.....			42	
Japan.....			40	
Korea.....			358	
				76, 772
Oils, animal:				
United States.....			4, 542	
United Kingdom.....			534	
France.....			24	
Germany.....			7, 362	
Italy.....			4	
China.....			178	
Japan.....			262	
British Australasia.....			4, 816	
				17, 722
Provisions, meats and dairy products:				
Beef products—				
Canned beef—	<i>Kilos</i>			
United States.....	276 751		112, 702	
United Kingdom.....	665		240	
France.....	25		14	
China.....	22		16	
Japan.....	22		8	
British Australasia.....	23		16	
		277, 508		142, 996
Fresh beef—	<i>Kilos</i>			
China.....	86, 953		32, 878	
Hongkong.....	1, 731		504	
British Australasia.....	4, 816, 980		1, 583, 710	
		4, 905, 664		1, 617, 092
Salted or pickled beef—	<i>Kilos</i>			
United States.....	699		114	
China.....	90		58	
British Australasia.....	558		112	
		1, 347		584
Cured beef—				
United States.....			10	
Netherlands.....			22	
British Australasia.....			36	
				68
Hog products—				
Bacon—	<i>Kilos</i>			
United States.....	67, 754		57, 764	
United Kingdom.....	3, 191		2, 570	
Spain.....	2, 450		1, 686	
China.....	114		96	
Japan.....	227		100	
British Australasia.....	13, 990		11, 112	
		87, 726		73, 328
Hams —	<i>Kilos</i>			
United States.....	47, 704		37, 660	
United Kingdom.....	83, 701		68, 600	
Belgium.....	218		288	
France.....	923		746	
Italy.....	48		56	
Spain.....	1, 236		1, 426	
China.....	468, 476		198, 500	
Japan.....	197		116	
British Australasia.....	66, 482		61, 898	
		668, 985		369, 240
Pork canned—	<i>Kilos</i>			
United States.....	1, 057		562	
Spain.....	256		214	
China.....	89		44	
Japan.....	19		8	
British Australasia.....	196		40	
		1, 617		868
Forward.....				2, 923, 868

Statement of imports into the Philippine Islands, of animals and animal products, for the year ending June 30, 1910—Continued.

Imports	Quantity	Total.	Value	Total
Brought forward				₱2,923,868
Provisions, meats and dairy products—Contd.				
Hog products—Continued.				
Pork fresh—	Kilos			
United States	22,645		₱15,212	
China	80		30	
Japan	3,373		874	
British Australasia	137,411	163,512	69,440	85,556
Pork, salted or pickled—	Kilos			
United States	3,692		1,392	
Spain	69		64	
British East Indies	33		4	
Japan	18		8	
British Australasia	583	1,395	110	1,578
Lard—	Kilos			
United States	90,501		44,146	
United Kingdom	64		42	
Spain	2,244		1,028	
China	1,748,609		432,586	
All other British East Indies	73		38	
Japan	5		2	
Turkey in Asia	59		28	
British Australasia	51,822		18,556	
Egypt	55	1,808,432	8	496,384
Mutton, fresh—	Kilos			
United States	1,574		662	
British Australasia	325,684	327,258	80,404	87,066
Imitation butter—	Kilos			
United Kingdom	816		432	
Germany	55		34	
Netherlands	29,047		18,216	
Spain	61		20	
China	11,938		8,966	
All other British East Indies	6,087		4,504	
British Australasia	55	48,059	36	31,608
Poultry and game—	Kilos			
United States	734		732	
Spain	66		120	
China	1,411		708	
All other British East Indies	46		26	
French East Indies	422		154	
Hongkong	49		50	
Japan	2,855		2,202	
British Australasia	26,725	32,308	16,922	20,914
All other meat products—				
United States			131,281	
United Kingdom			17,850	
Belgium			540	
France			3,742	
Germany			2,708	
Italy			3,970	
Netherlands			14,952	
Spain			62,486	
Switzerland			454	
China			41,160	
Singapore			4	
All other British East Indies			924	
Japan			24	
British Australasia			35,384	318,482
Butter—	Kilos			
United States	134		214	
United Kingdom	2,462		2,912	
Denmark	64,046		84,328	
Germany	2,967		3,868	
Italy	2,388		1,992	
Russia	197		124	
Switzerland	34		38	
Forward	72,228		93,776	3,965,456

Statement of imports into the Philippine Islands, of animals and animal products, for the year ending June 30, 1910—Continued.

Imports.	Quantity.	Total.	Value.	Total.
	<i>Kilos.</i>			
Brought forward.....	72,228		₱98,476	₱3,965,456
Provisions, meats and dairy products—Contd.				
Butter—Continued				
China.....	216		158	
Turkey in Asia.....	9		4	
British Australasia.....	241,022		253,634	
		313,475		347,272
Cheese—	<i>Kilos.</i>			
United States.....	1,656		1,292	
United Kingdom.....	13,493		8,685	
Belgium.....	3,016		2,286	
France.....	2,582		2,234	
Germany.....	6,939		5,812	
Italy.....	419		400	
Netherlands.....	126,571		84,978	
Spain.....	718		534	
Switzerland.....	4,549		3,490	
China.....	770		90	
British East Indies.....	4		4	
Turkey in Asia.....	6		2	
British Australasia.....	4,083		1,732	
Egypt.....	65		12	
		164,871		111,504
Fresh milk—	<i>Kilos.</i>			
United Kingdom.....	3,833		910	
France.....	2,532		412	
Germany.....	49,033		9,766	
Italy.....	52,677		7,952	
Netherlands.....	21,056		2,854	
Norway.....	27,986		5,814	
Switzerland.....	425,359		70,920	
		582,476		98,628
Condensed milk—				
United States.....	779,816		232,850	
United Kingdom.....	1,503,911		537,766	
France.....	5,350		1,292	
Germany.....	34,283		7,438	
Italy.....	72,302		12,246	
Netherlands.....	986		232	
Norway.....	232,106		87,448	
Switzerland.....	204,385		56,420	
Canada.....	55,743		15,732	
British Australasia.....	1,043		340	
		2,889,925		951,764
Total.....				5,474,624

SUMMARY.

Total number of animals imported 49,987, value.....	₱1,871,674
Total value of animal products imported exclusive of United States Army imports	5,474,624
Grand total	7,346,298
Animal products imported free by the United States Army into the Philippines:	
Beef, 7,417,929 pounds at ₱0.086.....	₱1,275,883.78
Mutton, 428,872 pounds at ₱0.075.....	64,330.80
Total of dutiable imports brought forward	7,346,298.00
Total importations	8,686,512.58

Appendix IV.

BREEDS OF MILCH CATTLE AND CARABAOS FOR THE PHILIPPINE ISLANDS.¹

By DAVID G FAIRCHILD,

*Agricultural Explorer in charge of Foreign Explorations, Bureau of Plant Industry,
U. S. Department of Agriculture.*

During a stay in Ceylon and a visit to Poona, India, my attention was called to the question of the milk supply of these tropical regions.

Notwithstanding the marked improvement in the methods of milk sterilization, the continued use of canned milk and butter becomes finally, to anyone living in the tropics, unpleasant, and the question of securing fresh dairy products is a most important one for the comfort of European residents.

The best breeds of milch cattle, like Jerseys, Guernseys, and Holsteins, when introduced into the tropics very quickly degenerate. They are not suited to its climate and can not be easily acclimatized. They soon grow thin and sickly, cease giving large quantities of milk, and die.

In Ceylon several attempts to acclimatize them have been made, but with no success, and I am told that the dairymen who have made these trials have been obliged to return to the use of the South Indian or Madras breeds. Recently, however, the Sind cattle have come into prominence as a milch breed, and the introduction of this breed into other parts of India has been a great success. It is a remarkably vigorous race, and the cows are much better than the South Indian or Madras breed.

A visit made to the agricultural college in Colombo was very interesting in this connection. In the college herd the three breeds were represented.

The bulls of the Sind variety are great, handsome fellows, with immense humps on their shoulders, for they belong to the *Bos indicus* species. They were dark chestnut in color, with black extremities, and one could find nowhere healthier looking animals than these Sind specimens which were some time ago imported from Karachi. The cows were sleek coated, with large udders and fine broad backs—pictures of health. The Madras animals were of that long-legged, lean type which is so common in the Oriental tropics, and the cows had small udders and peaked backs; while the Jersey bull which had been

¹ From Bulletin No. 27, Bureau of Plant Industry, U. S. Department of Agriculture.

brought down from one of the high altitude tea estates, for breeding purposes, was a sad enough sight, pale about the eyes and mouth, sway-backed, and with hind legs all out of shape, though not nearly so ill-conditioned as the pitiful looking, emaciated cows of the same breed which were seemingly in the very last stages of consumption.

The object lesson could not have been more convincing nor the contrast between the perfect health of the Sind cattle and the mangy appearance of the European race more striking.

The statement by Mr. Driberg, the director, that without the Sind cattle it would be impossible to make up the Ceylon dairy was quite significant.

While in Poona, India, the site of the Bombay Agricultural School, I saw more of this Sind breed of cattle and learned that although it deserved all it was credited with in Ceylon, it has been superseded, for butter-making purposes, at least in the Bombay presidency, by the milch carabaos.

The carabao or water buffalo (*Bubalus bubalis* Lyd.) is a well-known object in Manila, and its use as a beast of burden thoroughly understood, but, so far as I am aware, little attention has been paid to it as a milk producer.

Unthinking prejudice, which prevents us from eating many excellent things, may play the same role in Manila that it does in Ceylon, and forbid the employment of the buffalo milk. If this is so it is a great pity, for there is a race of water buffaloes which come from Delhi, India, that gives over 30 pounds of milk per day, while the best Sind cattle give only 18, and this buffalo milk is so rich in fat that 12 to 13 pounds of it make a pound of butter, whereas 20 pounds of milk of a Sind cow are required.

These Delhi buffaloes are easier to keep, less expensive, and cleaner (having almost no hair) than ordinary cattle. They sell for about 180 rupees, or \$56 gold, in Bombay, and can be bought at Dawans, the buffalo market, near Grand Road Station, but could be best secured by applying to Mr. Mollison, director general of Agriculture for India, at Poona, who could probably be prevailed upon to arrange to have good specimens picked out.

In general, the animals are priced according to the amount of milk they give, 10 rupees being added to the price for every two additional pounds of milk given per day.

Another good variety of milch buffalo is that from Gujarat, called the Surti. It yields only about 20 pounds of milk per day, and is sold at from \$33 to \$36 gold. The cost of keeping

this variety per day amounts at Poona to only 16 cents gold, and it is considered the most economical race by Mr. Kelhar, the foreman in charge of the college herd. According to him, a dairy should have both buffaloes and Sind cattle. The buffaloes are better for butter production, and the cattle are superior for milk purposes, because the milk fetches a better price, being, in fact, much preferred to that of the buffaloes, which has a bluish color and a slight, though not disagreeable, odor.

Both the buffaloes from Delhi and Gujārat and the Sind cattle are well worth introducing into the Philippines. The buffaloes should be tested for butter making, though they cost more to feed than the Sind cattle, which latter will prove, however, especially useful for milk.

Breeding animals of these different races might be secured through Director Mollison, of Poona, who could arrange for their shipment to Manila through such a well-known shipping firm as Latham & Co., of Bombay.

As regards the quality of the butter made from buffaloes' milk, I can only judge from its general use in the Bombay presidency that it is in no way really objectionable, though its white color is not so attractive nor its aroma so full as that of Danish butter.

The introduction of these good milch breeds of cattle and buffaloes would add materially to the comfort of the white people in the Philippines, and deserves the serious attention of the Bureau of Agriculture.

Appendix V.

EXTRACTS FROM REPORT OF THE PROCEEDINGS OF A BOARD OF OFFICERS OF THE CIVIL GOVERNMENT OF THE PHILIPPINE ISLANDS AND OF THE UNITED STATES ARMY, APPOINTED BY THE SECRETARY OF WAR.

Report of Committee on Beef.

Committee.—Dr. G. E. Nesom, Director of Agriculture; Lieut. Col. David L. Brainard, Deputy Commissary General; Major C. R. Krauthoff, Commissary.

MANILA, P. I., December 10, 1910.

The committee appointed at the first meeting of the board, to investigate the native beef supply, with a view to substituting it, either wholly or in part, for the frozen Australian beef now

brought into the Philippines for Army use, submits the following report:

At the time of the American occupation in 1898 the Army was supplied with fresh beef from two ships that arrived from Australia with cargoes of frozen beef; these ships were the United States Navy boat *Culgoa* and the United States Army boat *Duke of Sutherland*. Australian frozen meats have been imported here ever since, for the Army. Only one shipload of beef came from the United States; this boat, the *Glacier*, arrived in 1899. In that year one hundred Indo-China beeves were also imported by the Army. These latter were killed, taken out to a refrigerating boat in the harbor and frozen, and an effort was then made to issue this beef to our troops. This meat, however, was so repugnant to the officers and enlisted men that they avoided it so successfully that finally the military authorities sold the remaining portion at auction, in open market.

Some study was made, a few years ago, of Japanese beef, with the hope that the requirements of the Army here might be met from that source; a shorter voyage than from Australia, but it was found that the purchasable Japanese beeves were both small and expensive. As no economy would be secured by this change, none was brought in.

From the above brief outline of the history of beef supply for the Army here, it will be seen that for years past, in fact from the very beginning of our occupation, the Army has used the frozen Australian beef; this is preferred to the American beef, because it costs less and has to come a much shorter distance, and equals in quality and quantity the home product, so far as our requirements here are concerned. Each year the military authorities here furnish circular proposals to all local dealers, calling upon them to submit bids for supplying the Army for the next fiscal year, but rarely are any local bids received. These circulars do not specify Australian beef, but call for beef of certain weight, quality, and quantity, delivered frozen in Manila. At present the Army contract is held by the Queensland Meat and Export and Agency Company (Limited), of Brisbane. The contract price for the fiscal year 1910 was \$0.081 gold per pound; this called for shipside delivery in Manila, up to October 1, 1909, when, owing to certain changes in tariff laws here, requiring the subsistence department to pay duty on this beef, the price changed to \$0.0857 gold per pound. The present price that went into effect July 1, 1910, for the present fiscal year of 1911, is \$0.08554 gold per pound.

The Army brought in from Australia, during the fiscal year 1910, the following:

7,417,929 pounds of beef, at \$0.086	\$637,941.89
428,872 pounds of mutton, at \$0.075	32,165.40
Total value	670,107.29

The amount brought in during the present fiscal year, 1911, which began July 1, 1910, has been as follows:

1,507,304 pounds of beef, at \$0.086,	\$129,628.14
85,876 pounds of mutton, at \$0.065,	5,581.94
Total value	135,210.08

This, in round numbers, means 8,000,000 of pounds of frozen beef needed annually by the Army in these Islands. At present it all comes directly from Australia to Manila, is unloaded and stored in the Manila Cold Storage Plant, then reshipped from that place to all of the stations in the Philippines as needed. The plan of the military authorities here is to keep always on hand, as a reserve, one full month's supply, about 670,000 pounds, and this is done. At the present time the beef ships arrive here about twice each month.

This Australian beef, used here by the Army now for almost thirteen years, has given almost steady satisfaction. At times some has had to be rejected, but this amount has been extremely small, and no more than it is natural to expect on any large and long contract. The beef has been found clean, palatable, thoroughly refrigerated, up to contract specifications, and preferred by our troops. Many reports, inquiries, and inspections have proved it to be all that it should be in quantity, quality, and in price. The prices at different posts in the United States vary, according to location of the posts, shipping and receiving facilities, amounts required, distance from packing houses, etc., but it is averaging about the same to-day at home, to the Government, as it is here.

Admitting that this Australian beef is to be preferred to the Japanese, Indo-Chinese, or American beef, for the reasons set forth above, we are led to the conviction that no change would be advisable unless it be possible to do one of two things—either use the native Philippine beef, or, failing to be able to do this, establish Government cattle ranches in these Islands. These two plans will now be set forth at length.

PART I.—NATIVE BEEF SUPPLY.

The supply of beef cattle in these Islands, suitable in every reasonable way for slaughtering purposes, is known to be very limited. No complete census has been made, so far as known, to determine the exact number, but the general knowledge of this committee regarding the whole Archipelago and the detailed knowledge of conditions around every post that has been furnished the committee by officers who are stationed in all of these places, establishes the fact beyond reasonable doubt that the number of native beef cattle is so limited as to preclude the possibility of substituting this native supply in sufficient quantities and of proper quality and at reasonable prices, in place of any portion of the present Australian beef.

Information obtained from practically every portion of the Archipelago enables this committee to regard 250 pounds as the dressed weight of the native beef steer. Dividing the 8,000,000 pounds needed annually for the Army by this divisor, it is seen that some 32,000 native steers would be required each year, and unquestionably the first year's purchase would so deplete the number of cattle in the Philippines as not only to make further purchases impossible for years to come, but would cause such a shortage of cattle here as to increase the price of native beef far beyond its present price, and thereby cause actual suffering to the native population, particularly the poorer classes.

By making careful inquiries of commissary officers throughout the Archipelago, who are naturally familiar with conditions in their localities, Table I is submitted herewith, showing the results of their recent investigations on this subject.

TABLE I.—*Estimate of number of native cattle available November 1, 1910, in the Philippine Islands, in vicinity of military posts, with estimated weight dressed and cost per pound in gold.*

No.	Locality		Number of cattle.	Health of same.	Dressed weight pounds.	Cost on hoof.	Price per pound dressed.
	Post.	Province.					
1	Camp John Hay	Benguet	250	Good	250	\$50.00	\$0.20
2	Fort McKinley	Rizal	0				
3	Camp Eldredge	Laguna	0				
4	Camp Treadwell	Pampanga	0	Surra			
5	Fort Mills	Corregidor	0				
6	Iloilo	Panay	0	Poor	250	75.00	.15
7	Fort Wint	Grande	0				
8	Camp Stotsenberg	Pampanga	0	Work		40.00	
9	Camp Wilhelm	Tayabas	0				
10	Liguan	Albay	0				

TABLE I.—*Estimate of number of native cattle available November 1, 1910, in the Philippine Islands, in vicinity of military posts, with estimated weight dressed and cost per pound in gold—Continued.*

No	Locality.		Number of cattle.	Health of same	Dressed weight pounds.	Cost on hoof.	Price per pound dressed.
	Post.	Province					
11	Calapan	Mindoro	* 500	Excellent	250	\$38 00	\$0.15
12	Camp Jossman	Guimaras	0	Poor			
13	Camp Gregg	Pangasinán	0	Fair ^b			
14	Warwick Barracks	Cebu	^a Few	Good	300	¢ 075	.125
15	Camp McGrath	Batangas	0	Good ^c	500	75.00	.25
16	Camp Wallace	Unión	^f 0				
17	Pettit Barracks	Mindanao	130	Good ^e	300	¢ .05	.10
18	Camp Bumpus	Leyte	20	Poor	300	50 00	.20
19	Camp Connell	Samar	6	Good			
20	Ipil	Mindanao	0				
21	Augur Barracks	Jolo	^b 6,000	Excellent	300	¢ .05	
22	Isabela	Basilan	100	Good	350		.25
23	Calapan	Mindoro	18,000	Good	400	18.00	
24	Landang	Sacol	0				
25	Camp Tampanan	Mindanao	0				
26	Torrey Barracks	do	0				
27	Bojelebung	Basilan	100	Poor	250	¢ .25	.30
28	Infanta	Tayabas	0				
29	Regan Barracks	Albay	162	Good ^d	275	19.00	
30	Reina Regente	Mindanao	0	Good			
31	Cotabato	do	50	Poor	150	¢ .10	.10
32	Tagabiran	Samar	0				
33	Camp Downs	Leyte	0				
34	Margosatubig	Mindanao	0				
35	Ludlow Barracks	do	^j 70	Good	300	¢ .075	.10
36	Camp Overton	do	0				
37	Camp Keithley	do	Few	Good		(^k)	
38	Momugan	do	0				
39	Pantar	do	0				
40	Camp Piso	do	^l 10	Excellent		30 00	
41	Dapitan	do	0				
42	Dalana	do	^m 0	Good	250	20.00	
43	Puerto Princessa	Palawan	ⁿ 30	do	225	¢ .09	.25
44	Pollac	Mindanao	100	do	400	¢ .03	.065
45	Camp Hayt	Samar	0	Bad	250		.25
46	Makar	Moro	^o 50	Good	400	15 00	
47	Camp Malita	Mindanao	0				
48	Davao	do	^p 6,000	Excellent	300	¢ .04	.09

^a Other herds also on this island.

^b 3,000 to 4,000 head within shipping distance of this post.

^c Per pound.

^d These are mostly imported from China. No herds on Cebu. Report says three large herds of several thousand each, on Leyte Island.

^e Occasional rinderpest. Said to be 10,000 cattle on Mindoro Island.

^f Some small herds in the Batanes Islands, north of Luzon.

^g Some surra. Report states a few small herds here and some large herds in the Davao District and in Cagayan de Sulu.

^h No herds of beef cattle in Sulu Islands. Natives are being induced to raise their cattle now, and not to sell for some years to come.

ⁱ Some surra. Before insurrection raised famous cattle. Now very few because of disease. Island of Burias has some 200 head. 1,100 head in Masbate.

^j Can supply 300 head annually. Some herds at Davao.

^k None for sale.

^l Probably 100 in next two years. No disease in past eight years.

^m Reported herds near Glau, on Sarangani Bay, Mindanao.

ⁿ Reports herd of 700 at Abarlan.

^o All cattle here are running wild.

^p Believe that 10,000 head could be shipped out annually, if Government encouraged the industry here. Plenty for local garrison and some few thousands for export now.

In the above table, wherever no cattle are shown in the column headed "Number of cattle," and the other columns are filled in, work cattle are meant. Various provinces are seen

to be wholly lacking from the table, and these omitted provinces may have cattle or may not. This table is compiled from all of the reports that have been received up to date—December 1, 1910. Totalling up this table, as well as it is possible to do so, there is shown about 36,668 cattle now available as beef animals. Of the number reported above as “reported existing” it is too uncertain a source to calculate. The Bureau of Agriculture some time ago stated, in one of its publications, that “an accurate census of all of the cattle in the Philippine Islands has not been possible thus far, but the study and investigations thus far made seem to show some 200,000 cattle of all kinds.”

It will be noticed, from this table, that the price per pound, dressed, runs all the way from 6½ cents gold at Pollac to 30 cents gold at Bojelebung; such an extension as to furnish only a poor idea of the average price upon which the Government might estimate. It will also be noticed that a few places report the animal condition as poor; these unfit cattle must be deducted from the total of 36,668 head, but they only amount to a few hundred.

The four posts that report large numbers are:

	Head.
Camp Gregg	6,000
Calapán, Mindoro	18,000
Augur Barracks, Jolo	6,000
Davao, Mindanao	6,000
Total	36,000

A careful study of this matter convinces this committee that it would be impossible to depend upon these four provinces, because of the uncertainty of supply, the liability of epidemics of surra, rinderpest, foot-and-mouth disease, and other serious cattle diseases, as well as because it would be unwise to exterminate, by slaughter, all of these herds for years to come.

The idea of being able to change from the present Australian beef to the native beef is still more clearly shown to be impracticable at the present time, by referring to the annual report compiled by the Insular Collector of Customs, Manila. In fact, these statistics set forth that, in addition to what native beef was consumed, the following importations of beef cattle were made as given in Table 2 herewith.

TABLE 2.—*Importations of cattle into the Philippine Islands, for the fiscal years 1908, 1909 and 1910.*

Year.	Number.	Value (gold).	From countries as shown.	Number.
1908	48,157	\$1,055,236	Spain	1
			China	27,895
			Hongkong	217
			British East Indies	113
			French East Indies	14,574
			British Australasia	52
			Total	43,157
1909	40,367	755,772	Spain	1
			China	16,068
			Hongkong	85
			British East Indies	521
			French East Indies	23,597
			British Australasia	95
			Total	40,367
1910	44,300	871,966	China	19,167
			British East Indies	609
			Dutch East Indies	1
			French East Indies	23,996
			British Australasia	527
			Total	44,300

In order to appreciate Table 2 still further, it must be remembered that even the native beef plus all of this imported beef, does not represent the meat required or consumed here by the civil population, for to show this would necessitate adding all of the canned meats, mutton, ham, etc., brought in, as well as the 8,000,000 pounds annually used by the Army. This appears to this committee to be very conclusive evidence that the native beef supply can not yet be used by the Army. No business firm here would import beef, if palatable and sufficient native beef could be used.

It is conceded that the question of palatability is also an important one, and that in this respect the beef used must be agreeable to those for whom it is intended. Table 3 herewith is submitted as giving the opinions of the forty-eight posts mentioned in Table I.

TABLE 3.—*Opinions from 48 Army posts in the Philippines, as to the palatability of native beef, compared to the frozen Australian beef now furnished the Army.*

Opinion.	Posts.	Remarks accompanying same
Favorable	9	These posts believe some trials might be made, under careful Government supervision
Unfavorable	23	Meat found tough, stringy, no flavor, dry, unpalatable generally, unwholesome, flabby, supply too uncertain, too much disease prevalent.
Negative	16	Never used native beef. All of the others have had more or less experience with it.
Prefer Australian frozen beef.	39	Are unqualifiedly in favor of the present supply.

The committee is also of the opinion that the prevalence of rinderpest, surra, foot-and-mouth disease, and other forms of sickness among the native cattle is something which would further operate against the use of this beef at present and for some years to come. While the efforts of the Bureau of Agriculture are being directed toward the extermination of cattle diseases here, much time must elapse before such a condition of general health is reached as to encourage cattle raisers to return to their work and exhibit a willingness to invest large sums.

Much study has been given this subject by the military authorities here, in past years, and the following résumé of the opinions reached by others, from time to time, is given below in Table 4.

TABLE 4.—*Reports of various military authorities, on native Philippine beef.*

No.	Authority.	Date.	Extract from report.
1	Chief commissary, Philippines Division	July 1, 1900	"The problem of supplying fresh meat to the troops has been the one presenting the greatest difficulties. There are comparatively few cattle in these Islands. They are very small and very subject to disease. On February 9, 1900, general authority was given to all commissaries at posts which could not be reached by frozen beef, to purchase in vicinity of posts such beef as could be procured. Under this authority a large number of posts have obtained fresh beef, ranging in quantity from a full supply down to 2 days in 10. At a number of posts no beef could be procured. The quality of the beef so procured is reported as inferior."
2	Chief commissary, Department of Northern Luzon	July 1, 1902	"As a result of the ravages of rinderpest among the native cattle, a fresh-beef famine has existed among the Islands for two years past. Small numbers of cattle have at times been purchased in the Island of Tuga, 40 miles north of Luzon, and shipped by transport to Aparri, to Vigan and San Fernando, Union, and thence distributed to interior points, the price paid at point of purchase being about \$25 gold per head, the cattle averaging about 200 to 250 pounds net beef. At some few points of the department—as at Cervantes, Lepanto; Concepcion, Lepanto; Gazan and Boac, Island of Marinduque; Mangarin and Pinamalayan, Island of Mindoro; Mauban and Atimonan, Tayabas—limited quantities of beef have been irregularly purchased at prices ranging from \$0.063366 per pound on the Island of Mindoro, to \$0.20 in Tayabas and Lepanto. This source of supply is now practically exhausted, and stations generally depend for their beef on the frozen article purchased in Australia, brought thence by refrigerator steamer and shipped from Manila by transport and coast lines, launch and rail to a large number of stations in all parts of the department, from which it is further distributed by cascocs, wagons, bull carts and pack mules to the points more remote."
3	Commanding General, Department of Southern Philippines.	Aug. 8, 1902	"Disease (rinderpest) and a lack of any systematic attempt to breed cattle has depleted the Islands of native cattle so that the supply is quite wholly dependent upon imported refrigerated meat."
4	Chief commissary, Seventh Separate Brigade, Zamboanga.	June 30, 1902	"Beef cattle were purchased at points in Paragua and at Davao and shipped to north coast posts, and also to Parang, with the result that most of them died of rinderpest, and this plan of supply was at once abandoned."

TABLE 4.—*Reports of various military authorities, on native Philippine beef—Continued.*

No.	Authority.	Date.	Extract from report.
5	Chief commissary, Philippines Division.	July 13, 1906	"It would seem desirable that some method be adopted to encourage the raising of beef cattle in this locality, and I recommend consideration of the Army co-operating with the Civil Government by taking its supply of beef for troops in this division from persons entrusted with such a scheme. On account of disease, of course, capitalists are afraid to invest in cattle to be grazed and raised in the islands, although in former years great numbers of cattle were raised in certain localities inexpensively and with profit. It would seem desirable to undertake, under Government supervision and perhaps at Government expense, the raising of cattle for local slaughter and refrigeration in the islands."
6	Chief commissary, Philippines Division	Sept 1, 1910	"Owing to the lack of native cattle, many beef animals are imported in the Philippines from China, French East Indies, and Australia. The value of the cattle imported in 1909 amounted to nearly \$1,000,000. It is understood that a large percentage of the native cattle in these islands are afflicted with tuberculosis. The quality of the beef is inferior to the beef consumed by the most impoverished laborer in the United States."
7	The commissary, Camp John Hay, Benguet	Sept 3, 1910	"The quality of native beef purchased during the typhoon season of last year was fairly good. The first lot furnished was not satisfactory, on account of not being properly bled, but later deliveries were required to be bled freely and then thoroughly frozen, which gave much better satisfaction. Price paid per pound, \$0.15."
8	Chief commissary, Department of Luzon.	Aug. 30, 1910	"Native beef purchased at Puerto Princesa, Palawan, for two companies of Philippine Scouts, in November, 1905, at \$0.10 gold per pound. The commanding officer of that post, on May 27, 1909, reported as follows: This beef is of a very poor quality, being poor, stringy, and in my opinion not very nutritious. In fact, I do not eat it myself, and the enlisted men do not like it. It is necessary to cook the same before the animal heat leaves the body to keep it from spoiling, and about the only way it can be used is to boil it."
9	Chief commissary, Philippines Division.	Nov 19, 1910	"All fresh beef used at Malabang, Mindanno, between November or December, 1900, and October, 1901—some twelve months—was native beef, which was purchased on the hoof, grazed from two weeks to two months, depending on the condition of beef, size of herd, etc., and slaughtered by the soldiers. The beef was inspected by surgeon when slaughtered and dressed. No diseased beef was found. Quality excellent and gave universal satisfaction. Size, small. Cost, 4 to 6 cents per pound, gradually rising toward end of period, when supply was presumably being decreased. The tall cogon grass was cut and burned and the new grass growing up made excellent grazing for the cattle. Size of herd averaged 20 head. These cattle were purchased weekly in market, from Moros. Cows were principally used."
10	Chief commissary, Philippines Division.	July 16, 1910	"Frozen beef of hind quarters only, and mutton, as in the past, are supplied from Australia, under annual contract, and deliveries are made monthly at the Insular Cold Storage Plant, in this city (Manila). Under instructions from the Commissary-General, to experiment with frozen beef that had been in cold storage for considerable periods, several quarters of the regular beef received under contract from Australia were put aside for this purpose on April 20, 1908; one quarter was examined April 20, 1909, and found to be in excellent condition. A second quarter was withdrawn on May 31, 1910, after a period of over two years had elapsed, and samples turned over to the Medical Department of the Army and to the Insular Bureau of Science for bacteriological and chemical examination and feeding tests, and the tests demonstrated that fresh beef, under stress of circumstances, may be kept in good condition for two years or longer, provided a low and uniform temperature be maintained."

TABLE 4.—*Reports of various military authorities, on native Philippine beef—Continued.*

No.	Authority.	Date.	Extract from report.
11	Acting Director, Bureau of Agri- culture	Sept. 17, 1910	"There are no accurate figures at present relative to the number of native cattle in these Islands; the number is estimated to be about 200,000. A very small percentage of this number is available for beef purposes. The animals that are killed for beef are usually killed in the vicinity in which they are raised, for local consumption. During the past fiscal year 2,986 native cattle were received in Manila and practically all of these were killed for beef."

In order to determine how much native beef is being consumed annually in and around Manila, the principal dealers in Manila have been consulted, and Table 5 below shows business done during the past year.

TABLE 5.—*Native beef handled by the leading meat dealers and cold storage companies of Manila, during the past year.*

No	Firm	Amount of native beef	Remarks
1	Lack & Davis.	None	Never handled native beef, handles imported meats altogether, beefs from Indo China, China, Hongkong are used. States no native beef cattle exist here. Can furnish Hongkong beef, equal to and hind quarters, frozen, at 7 cents gold per pound. This would mean an annual saving to the Government of \$118,000 gold against Australian beef now bought. This saving would be greater the following year, by competition. Beef said to be excellent, and is now being furnished the Government at Bilibid Prison.
2	Faustino Lichauco	None	Never handled native beef; reason, poor and scarce. Brings in Australian, Chinese, and French East Indian beef on hoof and slaughters here. Is preparing refrigerator steamers to bring Australian beef here, and will be prepared to furnish same to Government at about 5 cents gold per pound, delivered in Manila, as soon as his steamers are ready—in about six months. Will be same beef as Army gets now.
3	Castle Bros.-Wolf & Sons.	None	Never handled native beef, reason, poor and scarce. Imports wholly Australian.
4	Philippine Cold Storage.	None	Never handled native beef, reason, poor and scarce. Imports from China and Hongkong only
5	Independent Cold Storage.	None	Same remarks as No. 4 above
6	International Cold Storage.	None	Only handles American and Australian beef.
7	Slaughterhouse		All beef cattle coming to Manila are slaughtered here and officials state that in one year not over 100 native beef cattle are slaughtered here, and these are very poor.

Before closing this consideration of native beef under present conditions, the committee desires to lay before the board the seriousness of the epidemic diseases prevalent throughout the Philippine Islands; the three most serious are rinderpest, surra, and foot-and-mouth disease. The spread of any contagious disease is usually due, in a measure, to lack of information on the part of the people. This is particularly true in a country like

the Philippines, where the means of disseminating information are comparatively limited. The Bureau of Agriculture has prepared and distributed pamphlets and circulars to all municipalities and as many barrios as possible; these circulars contain descriptions of the various diseases of cattle, the symptoms, how sick animals should be cared for, what steps should be taken to prevent the spread of disease, etc. All provincial governors, municipal presidents, and district health officers, in all of the provinces, have been asked to coöperate in spreading the information contained in these circulars. The Bureau of Agriculture has long been laboring to lessen, and if possible eliminate, wholly, these diseases, sending experienced veterinarians to any district reporting disease. Nevertheless, enormous losses have resulted throughout the Islands, and at any time one of these diseases is liable to suddenly appear in some district and sweep away practically all of the cattle there. Should the Army attempt to rely at present on the native beef supply, even in part, this source of sudden stoppage of supply must never be disregarded, with the consequent high price the Government would then have to pay in making emergency purchases, at short notice, to fulfill the demands of the service.

The following reports of the Bureau of Agriculture are submitted:

TABLE 6.—*Cattle diseases now existing in the Philippine Islands, 1910.*

[From the Agricultural Review.]

No.	Date	Extract
1	August, 1910	"Rinderpest is a contagious and infectious disease which attacks cattle, carabaos, hogs, goats, deer and other animals. This disease has destroyed thousands upon thousands of cattle and carabaos and has caused enormous losses throughout the Philippines. Rinderpest exists to-day and many parts of these Islands and new outbreaks frequently occur. This disease can be controlled and the country entirely freed from it, but this work can only be done with the active and intelligent assistance of all local officials and all persons who own or use cattle or carabao."
2	January, 1910	"Only two serious outbreaks of rinderpest occurred in 1909, one was in the Cagayan Valley and one in the Island of Siquijor. During the year 22,285 carabaos and 6,169 cattle were inoculated with anti-rinderpest serum, 3,322 carabaos and 312 cattle were re-inoculated, 639 carabaos and 153 cattle died after inoculation." This report does not state how many died beforehand.
3	January, 1910	"Surra is undoubtedly second in importance to rinderpest, and it has apparently been more prevalent this year than last. Reports have come in from 18 provinces. The only serious outbreaks have been on the Islands of Marinduque and Bohol, where it has done considerable damage. A total of 779 animals were found infected, 329 were killed and 166 other deaths are reported. For the first time in several years this disease appeared in Manila during April 1909, it was soon eradicated and did comparatively little damage."
4	January, 1910	"Glanders has been found in 18 provinces, but no serious outbreaks."
5	January, 1910	"Foot-and-mouth disease has given considerable trouble in various sections of the Islands. It has appeared in some 23 provinces, but it has steadily decreased by improved quarantine service, and at the present time, January 1910, the provinces are comparatively clean. Some 10,673 animals were infected, and 125 deaths are reported."
6	January, 1910	"One hundred cases of ulcerative lymphangitis and nine deaths were reported from ten provinces."

TABLE 6.—*Cattle diseases now existing in the Philippine Islands, 1910—Continued.*

No.	Date	Extract.
7	July, 1910.	<p>When General Orders No. 15, which is now published to the Islands, went into effect, it marked a turning point in the history of animal diseases in the Philippine Islands. For nearly 25 years rinderpest has prevailed here, and during recent years both surra and foot-and-mouth disease have gained a strong foothold. For the past ten years the imports of live stock into these islands, mostly from the Chinese Empire, have been from forty to fifty thousand head of cattle and carabaos per annum. During the past three years practically all shipments of live stock that have arrived here from China have been infected with one or more of the above named diseases. More animals thus imported into the Philippine Islands have been affected with foot-and-mouth disease than with either of the other two diseases named; but the constant introduction of rinderpest infection by means of these importations has been the most prolific source of this disease, and has been found the most serious menace to the live-stock interests of this country. There have been two conflicting interests always present; one, the demand for more cattle to replace those that had died of disease, the other, the constant reintroduction of diseases against which a campaign was being waged. All parties concerned have exerted every possible effort to secure such action on the part of the Government as would be favorable to their own special interests. The men who have made the strongest demands for the privilege of importing cattle, even though it was known that such cattle were constantly bringing in disease, have been the cattle dealers of Manila. The policy of the Government for the past ten years has been to permit the importation of live stock under certain restrictions, even though it might be infected. At the time that the Bureau of Agriculture was transferred to the Department of Public Instruction, this matter was taken up for consideration with the result that the policy was changed so as to prohibit the bringing into the Islands of infected animals. General Order No. 15 had the immediate effect of excluding infected cattle coming from the ports along the China coast, although it did not exclude cattle coming from Indo China. There is now developing an extensive cattle business between Australia and the Philippines which promises to supply the demand for slaughter cattle in the Philippines. The larger part of the cattle imported for work purposes are carabaos coming from the vicinity of Saigon, Indo China. With the prospects as bright as they are at the present time for the entire suppression of contagious diseases of animals in the Philippine Islands, there is reason to believe that the native animals will increase to such an extent as to largely take the place of the supply previously imported. The new policy of the Government with respect to the exclusion of animal diseases, and the guarding of the live stock industry so that the supply of live stock of the Islands may be replaced by local production, is one that should of receive the heartiest approval and support of all.</p>

To further appreciate the matter of prevalent cattle diseases the following brief table is submitted:

TABLE 7.—*Statistics relating to diseases of the Islands; compiled from weekly reports of veterinarians and inoculators, published in the Agricultural Review of January, 1910.*

Disease	Number of provinces reported.	Number of animals affected.	Approximate number of animals exposed.	Deaths	Killed.
Rinderpest	34	8,605	109,089	6,128	15
Surra	18	779	12,438	497	329
Glanders	18	312	1,179	56	48
Foot-and-mouth disease	23	10,673	1,487	125	
Lymphangitis	10	100	75	9	
Septicemia	5	57	2,122	18	
Hog cholera	4	67	960	68	

PART II.—CATTLE RANCHES.

The idea of the establishment of cattle ranches by the Government, or at any rate under careful governmental supervision, has been considered by various officials almost ever since the American occupation. Some have been in favor of experimental work and others not at all, the opinions varying from the conviction that it would be a success to the directly opposite view. By reference to Table 4, item No. 5, it will be seen that the chief commissary, Philippines Division, submitted such a recommendation as early as July, 1906.

The Bureau of Agriculture, at the Alabang experimental farm, has carried on various experiments, all very thoroughly, in the raising of cattle in these Islands, and the official report, as contained in the AGRICULTURAL REVIEW of January, 1910, reads as follows:

The American and Australian cattle kept at this farm have not done well, in spite of the fact that they have received at all times a liberal ration of concentrated feed. The young calves are always weak and many of them die before the weaning period, while the mestizo calves and Chinese cows have kept in good condition upon nothing but native grass, even during the dry season. A sufficient length of time has been given to this matter to settle practically once and for all the question of growing pure bred cattle from the temperate zone, and it is recommended that no further attempt be made to grow this class of cattle, but to confine our efforts to the growing of mestizos, using the Chinese or Spanish cows and high grade mestizo or full-blood American or Australian bulls.

The same publication gives the following report on the Trinidad experimental stock farm:

The cattle kept at this station consist of one herd of about forty native cows and a Galloway bull. The offspring are very thrifty and thrive on the pasture, requiring little help by feeding except during baguios and continued rainfalls. A good many of the mestizo bulls have been scattered throughout the provinces and good reports come from them wherever they have been placed.

These experiences indicate that, if the Government ever undertakes cattle raising here, no experiment would pay if using American or Australian cows; the Chinese, Spanish and native cows must be used, covered by Galloway, full-blood American or Australian, or high grade mestizo bulls.

About December, 1909, Lieut. Col. D. L. Brainard, the present chief commissary, Philippines Division, gave this cattle-raising subject considerable study, and was assisted by Capt. F. H. Lawton, chief commissary, Department of Mindanao. Appreciating the many advantages possessed by the Island of Mindanao for cattle raising, Colonel Brainard, on December 15, 1909, called on Captain Lawton, then in Mindanao, for a full

report in the matter. The report submitted follows herewith, verbatim:

HEADQUARTERS DEPARTMENT OF MINDANAO,
OFFICE CHIEF COMMISSARY,
Zamboanga, January 2, 1910.

Lieut. Col. D. L. BRAINARD,

Chief Commissary, Philippines Division, Manila, P. I.

COLONEL: In compliance with your letter (11556) of December 15 relative to a subsistence department herd of beef cattle in this department, I have the honor to make the following report:

One of the valleys mentioned by me lies north from Makar, which is situated on Sarangani Bay at the southern point of Mindanao, and has been very favorably reported upon by Major Heiberg, Philippine Scouts. Extract copy of his report enclosed herewith. General Pershing has also informed me that he knows this section and it is, in his opinion, the best available location.

The other valley lies to the south and eastward of Cagayan in Bukidnon. It has not been visited as far as I can determine by any but civilians, and I can make no definite report thereon, although I am informed that there is a large tract of good grazing land in the shape of a triangle which is practically enclosed by three rivers.

Investigation shows that there are comparatively few beef cattle being raised in Mindanao at present, due, it is believed, to an epidemic of rinderpest some years ago. The few cattle that are now being raised are doing exceptionally well.

The subject of rinderpest and surra and the probability of its appearance again, have been gone into, and it is not believed the risk is great enough to be considered. Its ravages in the past among the natives has been due largely to the fact that upon its appearance in one herd natives in that vicinity would take their cattle, after they had been exposed, and travel to another section, thereby introducing the disease there, which in turn would be carried on by the people of that section. Very little was known of the disease and absolutely no attempt made to eradicate it. With strict quarantine arrangements and a competent veterinarian there would be practically no danger under the system of successful vaccination that has been evolved by the Bureau of Science, making it possible to stamp out this disease at any time should it make its appearance.

The class of cattle met with in Mindanao are native, small and of beef type. When in good condition for slaughter, they weigh from 500 to 700 pounds and dress more than 50 per cent. Cattle in the hands of the Moros are much larger than those in the hands of Filipinos because the former take more pains in breeding. In this section there has been considerable crossing of the "sacred cattle of India" with native stock, with disastrous results, producing neither a milk nor a beef animal, the legs being long, flank cut high up, and size of bone increased.

During the past year a few range cattle from Port Darwin, Australia, have been brought in and turned out on the range. I have been informed by the veterinarian that none of these animals have shown any ill effects from the ticks or climate, and that they take well to the range and grass.

It is recommended that, if the approval of the division and department commanders can be obtained, an experiment be tried in the valley north of Makar, such number of selected native cows as may be determined upon being purchased from the herds at Mati, Davao, together with some Aus-

tralian bulls and cows, preferably from the northern part of Australia where the climate is somewhat similar.

A more detailed report with reference to the number of animals, cost, personnel, etc., will be furnished when desired."

The inclosure mentioned above follows herewith:

THE GOVERNMENT OF THE MORO PROVINCE,
OFFICE DISTRICT GOVERNOR, DISTRICT OF COTABATO,
Cotabato, September 30, 1909.

The PROVINCIAL SECRETARY,

Moro Province, Zamboanga, Moro, P. I.

SIR: The country between Makar and Kulanadal is a beautiful, open, gradually rising plain, covered with grass about knee-high and crossed every five or ten miles by mountain streams of clear, cool water. It reminds me very much of certain portions of eastern Wyoming, being decidedly temperate and untropical in appearance. The soil seems to become richer as we advance up the valley.

All in all, this is the finest stretch of country I have seen in the Philippines, and it appealed to me as being especially adapted to cattle raising. The grass is not cogon, and if kept short by frequent burning would, I believe, make good grazing. The Sultan of Talik had a number of ponies and Australian cattle, the former were poor specimens (thin and sore-backed from hard use and abuse), but the latter looked fat and in excellent condition.

This latter report is by Major Heiberg, of the Philippine Scouts, district governor of Cotabato. In a further report by Captain Lawton, dated Zamboanga, February 18, 1910, he furnishes the following information on this subject:

Selected native cows can be purchased in the Davao country at about ₱55 each. Shorthorn bulls from Queensland, Australia, can be purchased and landed here at about ₱300 each. Bengali bulls can be purchased in Singapore for about ₱200 each. The more thoroughly I go into this matter the more convinced I become that it would be a success if tried; my plan would be to secure first of all the services of a competent veterinarian, one who has devoted his time to cattle (I believe Doctor Oliver to be such a man), together with an interpreter and a detail of six enlisted men selected in the division for their knowledge of cattle.

The purchase of as many native cows as might be decided upon and a Shorthorn bull for about every one hundred cows, if their number were large, otherwise one bull to every fifty cows. I would also have a few Bengali bulls for experimental purposes—as some people with experience consider that the best results would be obtained from half-breed product of native cows and Bengali bulls and then to cross with the Shorthorn; all of these animals should be selected by the veterinarian, especially the Australian cattle, as they come from the sections of Queensland that have a climate similar to this and should be immune to "tick fever."

General Pershing has informed me that a company of scouts will be stationed at Makar which would furnish ample protection. Native herders can be secured at from ₱20 to ₱30 per month; I am informed that one native can look after one hundred to one hundred and fifty animals.

While this subject was still under consideration, the following correspondence occurred, bearing directly upon the cattle raising proposition:

HEADQUARTERS DEPARTMENT OF MINDANAO,
Zamboanga, P. I., April 23, 1910.

The ADJUTANT-GENERAL,
Philippines Division, Manila, P. I.

SIR: I have the honor to invite attention to the practicability of utilizing the country about Sarangani Bay for grazing purposes, with a view to the possibility of supplying troops in the Philippines with fresh beef. If we continue dependent upon outside sources for the supply of meat for the Army, it is possible that in the event of a complication with a foreign country the Army might find itself cut off from this component of the ration.

The country surrounding Sarangani Bay, especially on the northeast, north and west, is as fine grazing land as I have ever seen. It extends inward toward Lake Buluan, a distance of about fifty miles. The relative situation of the adjacent hills and mountains is such that precipitation takes place at the higher altitudes, and the rainfall of the territory in question is much less than in any other part of the Philippines within my knowledge. The several streams flowing through this section afford a bounteous supply of clear, cool water from the mountains.

The grass is very much like the grama grass of New Mexico and Arizona, which is considered very nutritious. During my visit there in the early part of the present month, I saw at Glau, near the entrance to Sarangani Bay, a herd of about one hundred grass-fed cattle that looked as sleek and fat as corn-fed cattle. They were in excellent condition and would be considered first-class beef cattle in any market.

I am informed that rinderpest has never appeared in that part of Mindanao. All the conditions are such that there should be no difficulty in raising all the cattle needed for meat supply of troops serving in the Philippines; besides the money sent abroad annually for meat might as well be kept within our own possessions.

It is suggested that this matter be taken up for consideration by the subsistence department.

Very respectfully,

(Signed) JOHN J. PERSHING,
Brigadier General, U. S. Army, Commanding.

First indorsement

HEADQUARTERS, PHILIPPINES DIVISION,
OFFICE CHIEF COMMISSARY,
Manila, May 23, 1910.

Respectfully returned to the adjutant-general, Philippines Division, Manila, with remark that the project of maintaining a herd of beef cattle in Mindanao for use of the Army was first brought to the attention of this office in November, 1909, by Captain Lawton, then chief commissary, Department of Mindanao; but no action was taken at that time as it was regarded as a matter requiring careful investigation and consideration. The correspondence above referred to is herewith inclosed. (This is the correspondence just preceding.)

To supply the troops in these Islands with fresh beef from cattle owned by the Government would necessitate stocking the ranges, the construction of ranches, slaughterhouses, a modern cold-storage plant, offices, quarters

for employees, tracks and cars for loading and handling the meat, both in the green and frozen state, and the purchase of hundreds of articles of equipment required in an up-to-date slaughtering and freezing plant. Many of the cattle and horses would be brought from Australia, India, and the United States; the material for buildings from the United States and the equipment from the United States or Europe. The animals and material would have to be transported for great distances and at enormous expense; add to this the cost of installing and equipping a modern plant in a remote locality and the total amount involved would be so large as to be prohibitive. The cost of maintenance of such a plant would be very great to say nothing of the loss of animals through epidemics and by the predatory Moro. Moreover, should the Philippine Islands be invaded by the army of a foreign power, it may be assumed that a sufficient force would be at once detached from the hostile army and sent to Mindanao to relieve the subsistence department of any further care and responsibility of the cattle herds and the plant connected therewith. Thus the United States Army, by means of its own resources, would contribute to the aid and comfort of the invaders.

The Army can not enter into competition with established business houses in these Islands, hence any plant constructed by the Government would be used for its needs alone. The amount of business transacted in the Army would not justify the large expenditures necessary to properly build, equip, and maintain a plant of the size required, for its sole use. In commercial packing houses no part of the animal is lost, the whole carcass is transformed into by-products which augment the profits of the establishment and assist in paying the fixed charges. In an Army plant this could not, or rather would not, be done. The by-products would not be utilized, because the Government could not appear as a competitor with commercial firms.

The present force in the Philippines uses approximately 8,000,000 pounds frozen beef and mutton per year at a cost of about 8½ cents per pound for beef and 6½ cents per pound for mutton, which includes transportation and duties. This meat is transported from Australia in refrigerator ships, the contractor assuming all the risks; it is transferred to the Insular Cold Storage Plant and is later distributed throughout the Islands in our own vessels at a minimum of cost. The system is as nearly perfect as it is possible to make it; there is practically no loss; the method of handling is cleanly, each quarter being inclosed in a muslin slip and an outer covering of burlap. The price is reasonable, cheaper than meat of the same quality can be imported from the United States, and by this method of supply we are not putting all our eggs into one basket.

Attention is invited to the inclosed memorandum prepared for this office by the depot commissary, Manila.

It is recommended that, in the best interests of the service, the within suggestion be not considered at this time.

(Signed) D. L. BRAINARD,

Lieutenant Colonel, D. C. G., U. S. Army, Chief Commissary.

The memorandum referred to in this indorsement of Colonel Brainard appears below, and was prepared very carefully by Major Krauthoff, of the commissary department and a member of this committee. It will be seen that such an undertaking is enormous and costly.

DEPOT COMMISSARY, UNITED STATES ARMY,

Manila, P. I.

Memorandum for the chief commissary, Philippines Division, in connection with letter of the Commanding-General, Department of Mindanao, dated April 28, 1910.

Quantity of fresh meat required by the Army in the Philippine Islands per year, 8,000,000 pounds.

Number of cattle required to furnish that quantity of meat.—The average steer or heifer 3 years old will dress, trimmed according to specifications, about 500 pounds, and it will be necessary to slaughter 16,000 cattle per annum.

Herd required for slaughtering.—To provide 16,000 cattle annually, requires a herd as follows:

16,000 cattle 1 year old,
16,000 cattle 2 years old,
16,000 cattle 3 years old.

The three year olds will constitute the slaughtering herd, and drawn from as required.

Herd required for breeding.—To start the slaughtering herd, it will be necessary to have a crop of over 16,000 calves per annum.

There are many losses, due to disease, accident, and loss of calves, besides a portion of the cows are apt to prove to be without calves.

Fifty per cent gain in numbers may be considered a good average, counting losses of calves, yearlings, two and three year olds.

A certain number of heifers and bull calves must be reserved each year to keep up breeding herd.

To start the herd will require about 32,000 cows and at least 800 bulls.

Good, young Australian cows would cost about \$50 and thorough-bred bulls at least \$150, making the initial cost of herd \$1,720,000.

After starting the ranch the herd would be theoretically as follows:

End of first year:

Cows	32,000
Bulls	800
Yearlings	16,000
Total	48,800

End of second year:

Cows	32,000
Bulls	800
Yearlings	16,000
2-year-olds	16,000
Total	64,800

End of third year:

Cows	32,000
Bulls	800
Yearlings	16,000
2-year-olds	16,000
3-year-olds	16,000
Total	80,800

Beginning the fourth year, the 3-year-old cattle will be ready for slaughter.

Ranches.—The ranch would have to be divided into a number of ranches, each in charge of a ranch boss and necessary assistants; the various ranches being under charge of the head ranch boss. Buildings and corrals, fences, etc., would have to be provided.

Packing house.—A modern packing house, having a capacity for slaughtering 75 cattle daily, together with chill rooms and cold storage rooms for 750 carcasses of frozen beef would have to be built at or near the ranch, and at a place where steamers could receive and discharge cargoes.

The necessary appliances to care for the offal and waste products must be provided.

Refrigerator ships.—The principal distributing point for frozen beef is Manila, or very near Manila if any change is to be made. A refrigerator ship would be necessary to transport the frozen beef from the packing house to Manila.

In case of war.—In the event of war, the main body of our Army would be at or near Manila. It would be impossible to protect the lines of communication between the Army and the meat supply, provided the enemy was at all aggressive. In case of war, if time would permit, several shiploads of frozen beef would be rushed from Australia, and if that can not be done we will have to eat bacon and canned meats.

Horses.—A large number of horses would be required for ranch work.

Remarks.—The above data is based on the assumption that all fresh beef required for the troops in the Philippines would be raised on the ranch.

All of the above investigations regarding cattle ranches refer to the establishment of these ranches on the Island of Mindanao. Therefore, the following letter from Governor Van Schaick, of Mindoro, opens up knowledge of another Island favorable for such a project, and somewhat nearer Manila. In considering the detailed estimate of Major Krauthoff, the committee believes that for more cattle would probably be needed, as the estimated dressed weight of the native steer or heifer is believed to be nearer 250 pounds than the 500 pounds he has stated. The letter from Governor Van Schaick follows:

PROVINCIAL GOVERNMENT OF MINDORO,
Calapan, P. I., September 24, 1910.

Lieutenant JOHN W. WILEN,

U. S. Army, Camp McGrath, Batangas, Batangas, P. I.

DEAR SIR: In reply to your letter of September 20, I have the honor to inform you that there are approximately 18,000 head of cattle on Mindoro; 5,000 south of the sugar estate, on the Caguray River, owned by the friars and concerning which information can be had from the Procurador de los Recoletos, Manila, P. I.; 5,000 more near Sablayan, owned by Pedro Fernandez, Sablayan, Mindoro; 2,000 near Abra de Ilog, owned by Manuel Lopez, Balayan, Batangas; and 1,000 near Paluan, owned by Mariano Abeleda, Paluan, Mindoro.

These cattle sell at an average of ₱35 per head, weigh 650 to 700 pounds live weight, and 350 to 400 pounds dressed. I do not know how much they would sell for dressed as they are not marketed that way. These herds should produce for the market from 9,000 to 10,000 head per year, allowing

for deaths and the increase of the herds. The cattle owners here figure that each cow will produce three calves each two years.

The cattle on the west coast of Mindoro are practically free from disease.

Should the Government itself contemplate raising cattle for the use of the Army in the Philippines, there is a valley, public land, near the headwaters of the Caguray River which empties into Iling Strait, that will bear investigation. It is 20 miles back in the interior, and is inclosed by high walls so that 2 or 3 miles of fence at the mouth of the valley would completely close it in. The valley is 5 miles wide and 20 miles long. Cattle there could be kept absolutely free from disease, and trail could be cut over which they could be driven to the point near the mouth of the Caguray River, where there is from 60 to 80 feet of water 100 feet out from shore. The mouth of that river is at Iling Strait, a perfectly protected harbor at all seasons of the year.

I do not believe it would be practicable to attempt to bring cattle down the Caguray River by water transportation, although, with a little dredging, they might be brought for some miles in that way.

The enormous expense attending the establishing of Government cattle ranches for the raising of the Army's beef appears to this committee to be altogether beyond what it would be reasonable to advise. The committee is of the opinion that the raising of beef cattle in these Islands should properly be left to the civil stock raisers; that these men, properly encouraged by the Government authorities, will gradually invest, slowly and as disease becomes less and less a source of dread, and ultimately there may be beef here for sale to the Government, but for some years to come the continued purchase of the present Australian frozen meat, under the usual contract arrangements now existing, is believed to be the very best that can be done.

As this report is being concluded there comes a report of a new rinderpest outbreak in Mindanao, Davao District, the adjacent country being involved, and already the Bureau of Agriculture has dispatched veterinarians to that place to fight the disease. This territory is adjacent to that recommended by General Pershing's letter above.

(Signed) G. E. NESOM,

Director of Agriculture, Chairman of Beef Committee.

(Signed) D. L. BRAINARD,

Lieutenant-Colonel, D. C. G., U. S. Army,

Member of Beef Committee.

(Signed) C. R. KRAUTHOFF,

Major, Commissary Department, U. S. Army,

Member and Recorder Beef Committee.

Supplementary Beef Report.

In the investigations of this committee, an effort has been made to ascertain why the local beef dealers never bid for the Army beef supply, and it is found that the refrigerator steamers running between Australia and Manila are largely controlled by a local firm known as E. S. Yuill & Co. While these people do not own the steamers, they are such large importers that they control the freight space in almost every refrigerator steamer in this business, thus making it possible to bar out competition. The local firms that are willing to bid state that even if they secured the Army contract for Australian beef, this firm of Yuill & Co. would be able to cause them serious loss by their secure control of this freight space, and therefore all local dealers are forced to stand aside.

However, as shown in Table 5, two local firms are endeavoring to arrange their own refrigerator ships so as to be able to compete; one firm is Lack & Davis, who are preparing to put on their own refrigerator ships between Hongkong and Manila for the handling of Chinese beef, and as shown in Table 5 of this report, the Government would make an annual saving *at the start* of some \$118,000 gold per year if we changed to Chinese beef, this firm getting the contract. The other dealer who is also arranging to put on his own refrigerator ships between Australia and Manila is Lichauco of this city, who states that he hopes to have his ships running in about five or six months, when he will be prepared to bid for the Army beef, and expects to be able to quote a price, delivered here in Manila, of five cents gold per pound. Such competition will lower the present price to the extent of a saving to the Government of some \$269,800 gold per year, and causes this committee to feel still more convinced that it is to the advantage of the Government to continue to use the Australian beef.

(Signed) G. E. NESOM,
Director of Agriculture, Chairman.

(Signed) D. L. BRAINARD,
Lieutenant-Colonel, D. C. G., U. S. Army, Member.

(Signed) C. R. KRAUTHOFF,
Major, Commissary Department, U. S. Army, Member.

Supplementary Beef Report, No. 2.

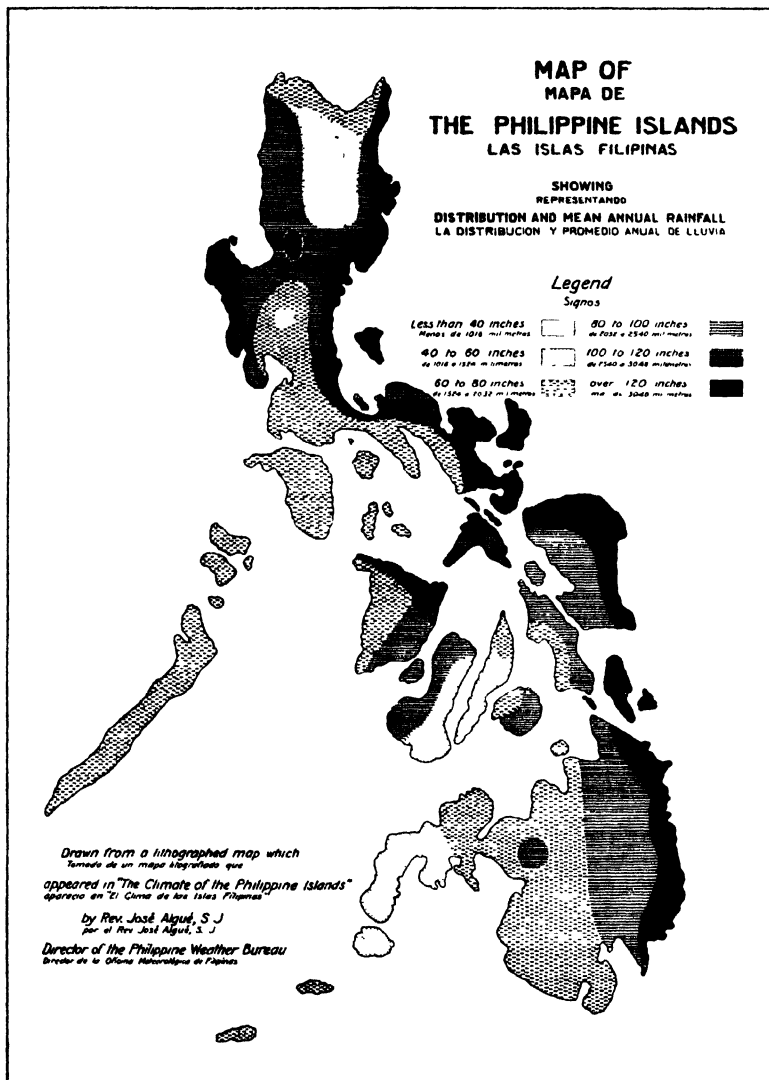
1. Since the preparation of this general report on the beef subject, the following information has been furnished the board

by the Bureau of Agriculture and is therefore appended here-
for the information of this board:

Dr. G. E. Nesom, Director of Agriculture, expresses the view that this Archipelago is naturally a good grazing country, in many parts, and is at present without an adequate supply of cattle. He believes that their successful production will not be possible until animal diseases prevailing in these Islands now are under control. Dr. Nesom also informs the Board that the 2,936 head of native cattle received in Manila during the fiscal year 1909, represent the receipts of native cattle in the channels of trade; it is probable that another thousand head were shipped to Iloilo and Cebu for slaughter and still smaller numbers to such towns as Zamboanga, Albay, and Sorsogon; it seems safe to say, however, from Doctor Nesom's knowledge of this subject, that practically all of the beef cattle in the Philippine Islands, except about 5,000 head, are slaughtered for local consumption near where they are raised, and this number is impossible to obtain.

2. The Bureau of Agriculture has recently been making a census of the cattle and carabaos in these Islands, and has found that the total number, including all classes of cattle, excepting carabaos, is now 232,277 head, to which must be added an estimated 5 per cent to include animals which have not been reported, making a total at present of about say 243,891 head. Assuming 20 per cent as the maximum number of these cattle which might be considered as beef cattle, this would give at present some 48,778 head instead of the 36,668 estimated in this report. The fact still remains that the purchase of all of these beef cattle would stop breeding, use up all in the Islands, and kill the industry. Table 8 shows the census by provinces.

No	Province.	Cattle.	No.	Province.	Cattle.
1	Agusan.....	311	21	Misamis.....	1,287
2	Albay.....	1,284	22	Moro.....	16,617
3	Ambos Camarines.....	1,373	23	Mountain.....	15,772
4	Antique.....	5,571	24	Nueva Ecija.....	3,051
5	Bataan.....	277	25	Nueva Vizcaya.....	623
6	Batangas.....	85,176	26	Occidental Negros.....	10,895
7	Bohol.....	6,549	27	Oriental Negros.....	3,779
8	Bulacan.....	1,344	28	Palawan.....	8,785
9	Cagayan.....	10,626	29	Pampanga.....	1,879
10	Capiz.....	8,115	30	Pangasinan.....	12,703
11	Cavite.....	8,110	31	Rizal.....	902
12	Cebu.....	11,107	32	Samar.....	1,408
13	Ilocos Norte.....	6,083	33	Sorsogon.....	6,046
14	Ilocos Sur.....	13,422	34	Surigao.....	491
15	Iloilo.....	6,198	35	Tarlac.....	1,370
16	Isabela.....	2,358	36	Tayabas.....	9,051
17	La Laguna.....	1,786	37	Zambales.....	1,869
18	La Union.....	4,024	38	City of Manila.....	889
19	Leyte.....	6,740			
20	Mindoro.....	9,953		Total.....	232,277



PART III.—THE PHILIPPINE ISLANDS AS A GRAZING COUNTRY.

An editorial appeared in the January, 1911, number of the PHILIPPINE AGRICULTURAL REVIEW entitled "A Conservation Policy for the Philippines." Among other things, this editorial points out that one of the greatest sources of natural wealth of these Islands is the unoccupied lands, for the most part unclaimed public domain which constitutes from 50 to 75 per cent of the area of the Philippine Islands, or about 40,000,000 acres. None of this land is occupied by commercial forests or used regularly for cultivation, and is for the most part grass land covered with cogon, tigbao, and other coarse tropical grasses which grow from 2 to 10 feet high, die down during the dry season and are burned off by the natives. A small percentage, of this land is covered by a scrub forest and brush where the shade is dense enough to prevent the growth of grass as a consequence of the killing of the timber growth by fire. Nearly all of this unoccupied territory is suitable for cattle grazing, provided the herds are made up of the native, Chinese, or Hindu types of cattle. Experience has shown that the modern breeds of European or American cattle will not thrive on this grass. Where lands are not grazed the grasses grow to be very tall and coarse and their usefulness for pasture purposes is lessened. Constant and close grazing, mowing, and burning tends to produce a fresh, tender growth which is much more valuable for grazing purposes than the mature grass. Many of these lands are deficient in shade, and during the dry season there are many places where water is a little difficult to obtain. Shade can be easily provided by planting out the rapid growing tropical trees such as the acacia, eucalyptus, and narra. Wherever there is a scarcity of water it can usually be obtained by digging a ditch from some spring in the hills to convey the water out to accessible territory, and in the level lands good success has attended the boring of artesian wells. The great extent of this territory places the Philippines among the pioneer countries like Argentina, South Africa, and the southwestern portions of the United States a few years ago, and indicates that they are destined to remain logically a cattle-grazing country for many decades to come. During the last half of the past century the Philippines obtained quite a reputation for the number of cattle raised, although the unfortunate introduction of rinderpest into this country greatly restricted the stock business during the six to eight years preceding the revolution. The live-stock business

is considered, at the present time, an extra hazardous enterprise on account of the prevalence here of rinderpest and surra.

The very strong efforts now being put forth by the Insular Government through the Bureau of Agriculture for the complete eradication of these diseases may result in accomplishing the desired end, as has been done formerly with foot-and-mouth disease, but until these two diseases no longer exist here the live-stock business will not be a safe investment. The prospective investor will find no difficulty in locating large grazing areas in almost all parts of the Archipelago. There are many thousand acres as level as a table top well supplied with springs and skirts of timber in the Provinces of Bulacan, Pampanga, Nueva Ecija, Tarlac, and Pangasinan, but more particularly in Nueva Ecija. The whole Cagayan Valley, 30 or 40 miles wide and about 200 miles long, is available for grazing, with the exception of a little ribbon of tobacco land on the banks of the Cagayan River and its larger tributaries. There is excellent grazing land on the south coast of the Province of Tayabas. The Island of Burias was used by the Government for the cattle offered for sale to replace the animals which died of rinderpest soon after American occupation. It is now practically free from cattle. The Province of Agusan is one vast table-land. After leaving the coast a few miles it is covered with a growth of native grass, is generally open country, and is cut here and there by small cañons running from mountain to seashore. The Cotabato valley, extending from the mouth of the Cotabato River to Sarangani Bay is a vast grazing land and forest covering over 2,500 square miles. The Island of Jolo contains excellent grazing lands and they are scattered all over large and small islands of the southern group in great abundance. In the Island of Panay there is a strip of rolling clay hills along the line of the Manila Railway Company between Passi and Dumarao, which is unoccupied and better suited for grazing purposes than any other use. Cebu is a densely populated island with all available land suitable for agricultural purposes in cultivation. Palawan is an island with a rugged backbone of hills cut by many small valleys on either side in which stock raising is carried on to a limited extent, but the available territory is many times over that which is now occupied. The southwest coast of Mindoro, both ways from Mangarin Bay, is a noted grazing country which has supported many thousands of cattle.

It is not a question of available lands for grazing purposes but of restoring conditions which will make the live-stock busi-

ness reasonably safe, and adopting a policy which will enable a man in the grazing industry to occupy the many desirable places to be found all over the Philippines. For the present all such persons can be accommodated on the Islands of Luzon, Panay, Mindanao, and other parts where satisfactory transportation by boat or rail is available.

(Signed) G. E. NESOM,
Director of Agriculture, Chairman of Committee.

(Signed) D. L. BRAINARD,
Lieut. Colonel, Department Commissary General, Member.

(Signed) C. R. KRAUTHOFF,
Major, Commissary Department, U. S. Army, Member.

MANILA, P. I., January 10, 1911.

Pursuant to call of the president thereof, the board met in Manila at 3 o'clock p. m., this date.

Present: All of the members except Capt. J. L. Knowlton, quartermaster, United States Army, who was returning to the United States, under orders.

The board then proceeded to a careful consideration of the report of the committee appointed to investigate the subject of native beef.

After thoroughly discussing all points regarding the substitution of native beef for the present Australian beef, as well as the idea of establishing Government cattle ranches in these Islands for the raising of beef for the Army, the board was unanimous in its opinion that both schemes were impossible and impracticable at the present time and that a continuation of the present method of supply, by the purchase of the frozen Australian beef, was the best possible arrangement which can be made.

The board then adopted the report of the beef committee, in full, and directed that a copy of the report be forwarded to the Secretary of War, Washington, through the channel prescribed in the original order of the Secretary of War establishing the board.

There being no further business before the board, the board adjourned, at 5 p. m., to meet at the call of the president.

(Signed) NEWTON W. GILBERT,
Vice-Governor, Philippine Islands, President.

(Signed) JNO. J. BONIFACE,
Captain, Second Cavalry, Recorder.



(Photograph by O W Barrett)

PLATE I — DWARF COCONUT TREE, MISAMIS, MINDANAO

THE PHILIPPINE *Agricultural Review*

VOL. IV

OCTOBER, 1911

No. 10

CONTENTS AND ILLUSTRATIONS.

CONTENTS.

	Page.
Editorial	530
General Order No. 1, Importation of Cattle from Australia, Tasmania, and New Zealand, by the Director of Agriculture.	532
General Order No. 2, Regulations Governing the Importation of Beef Animals from Australia when Designed for Slaughter, by the Director of Agriculture.	534
Lawn Grasses in the Philippines, by C. V. Piper, Agrostologist, United States Department of Agriculture	537
The Importation of Cattle from Australia, by Archibald R. Ward, Chief Veterinarian	540
Tropical Fruits in the Visayas, by P. J. Wester, Horticulturist	545
Some Notes on Agricultural Pests, by David B. Mackie, Agricultural Inspector	555
The First Annual Catanduanes Live-stock Exhibition, by Dr. F. C. Gearhart.	559
Monthly Veterinary Reports—August and September	561
Monthly Crop Conditions—June and July	563
Current Notes: Sensitive Plant; Destruction of Lantana; Blight-resistant Coffees. Copra Trade in the Philippines; Philippine Hardwoods; Philippines at the San Francisco Panama-Pacific Exposition; Hemp Export Duty; Roselle	570
International Rice Congress and International Exposition of Rice Culture and Irrigation, Vercelli, Italy, Announcement.	574
Book Review. "Notes on the Soil and Plant Sanitation of Cacao and Rubber Estates," Harold Hammel Smith; by O. W. Barrett	576
Notes on Manila Markets for July	577
Principal Philippine Imports and Exports.	
For May	581
For June	582
For July	582
Crop Reports for the Quarter ending March 31, 1911	583
Range of Prices of Philippine Agricultural Products for the Quarter ending March 31, 1911	586
Temperature and Rainfall for Agricultural Districts in the Philippines:	
For June	587
For July	588

ILLUSTRATIONS.

PLATE I. Dwarf Coconut Tree, Misamis, Mindanao, (Photo by O. W. Barrett)..	Frontispiece.
	Facing page—
II. "Suâ" (<i>Citrus</i> sp.)	544
III. (a) "Samuyáo" (<i>Citrus</i> sp.). (b) "Pangi" (<i>Mangifera</i> sp.)	548
IV. (a) Larva of Cane Root Beetle (<i>Holotrichia vidua</i> Sharp). (b) Cane Root Beetle (<i>Holotrichia vidua</i> Sharp)	554
V. Banana Leaf Attacked by Banana-leaf Roller (<i>Erionota thrax</i>)	558
105448	529

EDITORIAL.

RICE FAMINE.

The present shortage of rice, not only in the Philippines, but throughout the Far East, amounting as it does to practically a severe famine, ought to teach the Philippine people a lesson.

All the rice lands of the Philippines are more or less subject to damage by heavy rains and the consequent floods. If such rains and floods occur during the growing period of the paddy more or less damage is sure to result. A typhoon is not necessary to cause this wholesale destruction of growing rice, since any cause that changes the peculiar requirements of lowland rice—which forms, of course, the great bulk of the rice crop here—will produce the dire result.

Since damage from water can not be prevented and since the Philippine people are at present very dependent upon wet-land rice for their standard food supply, the question arises, What should be done in case of failure of the Philippine rice crop? Leaving aside the commercial question of importing sufficient supplies to meet the domestic shortage we arrive at the simple conclusion of the difficulty—substitution of some other food for this. Custom, of course, plays a tremendously strong part in the habits of the people in the provinces and there is more or less physiological reason for some of their dietary habits, but the fact is, practically every individual, whether Tagalog, Visayan, Pangasinan, or of any other Filipino race, can live on a diet containing no rice whatever. In some localities a large part of the daily rations of the people is maize, and there is no doubt whatever that it could be and should be used much more than it now is by the peoples of the Archipelago. The trouble is that the average Philippine cook or housewife does not know how to properly prepare maize for human consumption; instead of thoroughly cooking it they are likely to treat it as they would rice, which, of course, requires only about one-half the amount of cooking that maize does. Beans, for the same reason, are by no means so commonly used as they should be among the Filipinos. When thoroughly cooked, beans are even more nutritious and supply certain important elements which are lacking in rice.

Wheat flour, mostly in the form of bread, is now a recognized feature of diet in a large percentage of the Philippine homes, but it might well be used to a much greater extent than at present.

Now is the most propitious time for the moving spirits in Philippine matters to urge upon the people the necessity of adopting a more varied form of diet, and in so doing to consider the various sides of the question thoroughly, remembering that while rice is a cheap and nutritious food it is by no means the only cheap food that may be produced abundantly in the Philippines, and that it is not to be considered as a *necessary* article of diet in any way in any locality. Even in the wet-land rice districts a crop of beans or corn, or, in many cases, a crop of each, could be raised on the same ground, which during the wet season is capable perhaps of producing nothing but rice. The inhabitants of the Cagayan Valley have come to realize that they must not place their reliance entirely upon tobacco to furnish them indirectly with food; and the sooner the inhabitants of the rice districts realize that they should not depend entirely upon rice for their food supply the better it will be for them physically as well as industrially.

The Bureau of Agriculture hopes this so-called "rice famine" will bring about the planting of a large amount of corn and beans in all the suitable areas throughout the Archipelago. It is an ill wind, indeed, which does not blow some good.

**GENERAL ORDER NO. 1, IMPORTATION OF CATTLE
FROM AUSTRALIA, TASMANIA, AND NEW
ZEALAND.**

By the DIRECTOR OF AGRICULTURE.

MANILA, P. I., *July 11, 1911.*

On and after date, dairy and breeding cattle from Australia may be landed at ports in the Philippine Islands when accompanied by a certificate of health and origin containing information as to the following facts:

The certificate will contain the statement of the owner, describing the animal as to breed, color, age, sex, brands, place of birth, and information as to all locations up to date of departure. The owner will declare under oath that the above information furnished by him is true and that the animal has never suffered with contagious pleuro-pneumonia nor been in contact with animals so affected.

The certificate of health and origin will further contain information certified by the chief federal quarantine officer of the State of Australia from which the cattle were embarked, as to the following facts:

(a) That the animal above described has always been in a closely settled district or districts in which the conditions as regards animal disease have been constantly and exactly known by the department of agriculture.

(b) That the animal has not during the twelve months next preceding the date of issue of the certificate suffered from or been in contact with any animal suffering from any contagious disease (tuberculosis possibly excepted) and has never been in any district in which contagious pleuro-pneumonia existed at the time.

(c) That the animal was submitted to the tuberculin test by _____, federal quarantine officer, and a satisfactory negative reaction was obtained. A complete record of the temperatures of all of the animals tested, date of test, etc., is attached.

(d) That the animal is being shipped by the steamer _____ sailing from _____ on _____

(e) That the fodder supplied for use on the voyage has not been exposed to infection of contagious pleuro-pneumonia.

(f) That he has ascertained from an official source that the vessel in question has not transported on the last voyage, cattle not accompanied by a certificate similar to this, or if such cattle have been transported, he will certify that the vessel has since been properly disinfected.

Cattle so certified will be marked with a special brand by a qualified official in Australia, and cattle not so branded and certified, will be refused landing in the Philippine Islands except for slaughter at Sisiman.

Cattle accompanied by certificate may be refused landing in the Philippine Islands except for slaughter if they have been transported from Australian ports in vessels that have transported cattle not so certified during the same trip or on previous trips without the vessel having been disinfected since to the satisfaction of a properly authorized representative of the Commonwealth of Australia or of the Government of the Philippine Islands.

Dairy and breeding cattle from Tasmania and New Zealand will be allowed to land in ports of the Philippine Islands when accompanied by a certificate from the local federal quarantine officer of the Australian port where transshipped, to the effect that the animals were kept under Government supervision during transshipment and were not exposed to infection of contagious pleuro-pneumonia. Such dairy and breeding stock from Tasmania and New Zealand will be allowed to land in the Philippine Islands only when transported from Australia under the conditions above specified for such stock of Australian origin. Such cattle from New Zealand must be accompanied by a certificate from the department of agriculture to the effect that the Dominion is wholly free from contagious pleuro-pneumonia, that the animals have been tested with tuberculin with negative results, and that the ship has been thoroughly disinfected if it has transported infected cattle previously. A complete record of the temperatures of all the animals tested, date of test, etc., will be attached to the certificate.

All certificates accompanying cattle from Australia will be addressed to the Director of Agriculture, Manila, in care of the master of the vessel transporting them.

G. E. NESOM,
Director of Agriculture.

Approved:

W. CAMERON FORBES,
Acting Secretary of Public Instruction.

**GENERAL ORDER NO. 2, REGULATIONS GOVERNING
THE IMPORTATION OF BEEF ANIMALS FROM
AUSTRALIA WHEN DESIGNED FOR
SLAUGHTER.**

By the DIRECTOR OF AGRICULTURE.

MANILA, P. I., *July 26, 1911.*

1. Cattle embarked at Australian ports, except as provided in General Order No. 1, series 1911-12, dated July 11, 1911, may, after July 26, 1911, be discharged and landed for slaughter only at the stock yards of the Bureau of Agriculture at Sisiman Bay, Province of Bataan, and nowhere else in the Philippine Islands.

2. Proper entry of the vessel will be made with the Collector of Customs in Manila before any cargo can be discharged. The usual inspection of the imported cattle will be made by a representative of the Director of Agriculture and the regular inspection fee of 20 centavos a head will be charged.

3. Owners of live stock will unload, drive, feed, and butcher cattle *besides being responsible for transporting the meat to Manila. The conditions under which the meat is kept during transportation shall be satisfactory to the Director of Agriculture, but the owner shall not be relieved of the responsibility of landing meat in Manila in a wholesome condition, conforming to food-inspection requirements.* All dead animals, condemned carcasses, and parts, will be disposed of by the Director of Agriculture, with the reservation that the owner be responsible for disposing of dead animals pending the installation of suitable apparatus for disposing of same.

4. The superintendent of the Sisiman stock yards and matadero will have charge of all operations carried on therein, including the general system of butchering and dressing. There will be charged a fee for slaughtering animals amounting to 3 centavos per kilo of dressed meat, including livers, hearts, and tongues removed for sale or consumption, but no fees will be

collected on condemned meat. Each piece of meat will be weighed by the superintendent and marked with tags showing the weight, together with the name and address of consignee if so desired by the owner. The superintendent will make a daily statement showing the number of pieces, weight of each, and gross weight of meat removed by each owner, forwarding the same daily direct to the Collector of Internal Revenue, and duplicate copy to the Director of Agriculture.

5. Within thirty days after slaughter begins, the Collector of Internal Revenue and Director of Agriculture will ascertain the cost from meat owners for transporting meat from Sisiman to Manila, or arbitrarily fix the sum, and the Collector of Internal Revenue will rebate this amount from the total fee of 3 centavos per kilo for dressed meat. The rebate shall be wholly within the discretion of the Collector of Internal Revenue and the Director of Agriculture to change from time to time without notice as they shall see fit, and every person, firm, or corporation using the matadero accepts this condition; provided, however, that such rebate shall be contemporaneously equal for all persons at all times; and provided further, that at no time shall it exceed the lowest cost incurred by any user of the matadero for transportation to Manila, nor in any event the cost at which, in the estimation of the Director of Navigation, the Government could render such service. Books of account shall be opened for inspection in connection with ascertaining cost of transporting meat from Sisiman to Manila. Fees shall be collected in such manner and at such time as may be determined by the Collector of Internal Revenue.

If two or more persons or firms are engaged in the slaughter of animals in the Sisiman matadero all meat shall be transported to Manila in one vessel in accordance with arrangements to be made between the principals. Upon failure of the principals to agree as to charges, etc., for such transportation, the Director of Agriculture may take over the transportation of meat from the matadero to Manila, in which case no rebate for transportation will be allowed and owners of meat will be required to pay the actual cost to the Bureau of Agriculture for such transportation.

6. Meat shall be discharged at a point on the Pasig River designated by the Collector of Customs and further delivery will be made in exactly the same manner as meat is delivered from the Manila matadero to various parts of the city, the owner paying the usual transportation fees to the city of Manila.

7. The Director of Agriculture reserves the right to make a slight charge for yarding cattle, to cover cost of water, labor,

police, superintendence, deterioration, etc., as soon as it is possible to determine same.

8. The Director of Agriculture reserves the right to slaughter at Sisiman any cattle diseased or exposed to disease when, in his judgment, this is necessary to protect the live-stock interests of the Philippine Islands in general. In such event all precautions possible will be observed to prevent losses from infectious diseases of cattle, but the Government of the Philippine Islands disclaims all responsibility for such losses from cattle diseases.

9. General Order No. 16, dated July 19, 1910, is hereby repealed.

G. E. NESOM,
Director of Agriculture.

Approved:

W. CAMERON FORBES,
Acting Secretary of Public Instruction.

LAWN GRASSES IN THE PHILIPPINES.

By C. V. PIPER,

Agrostologist, United States Department of Agriculture.

The growing of satisfactory lawns in the Philippines presents no special difficulties, but inquiries concerning the making of lawns are frequent. In the preparing of a lawn the land should be thoroughly worked by plowing and harrowing until the land is in fine tilth. In the United States most lawns are planted by the sowing of seeds, a method not applicable with the grasses most valuable in the Philippines. These grasses are Bermuda grass, Korean grass, St. Augustine grass, and Lippia, all of which are best planted from roots or runners. In making a small lawn with any of these grasses it suffices to plant small pieces of the plant in rows about one foot apart and the plants a foot apart in the rows. With such planting, under favorable conditions, the ground should be completely covered with the grass in from thirty to sixty days. In case the desired lawn is large, it is greater economy to cut up the Bermuda or other sod in small pieces by running it through a feed cutter, scattering the pieces broadcast over the newly harrowed ground and then rolling. Care should always be taken to have the lawn fairly well drained, as otherwise nut grasses and other plants which grow in wet places will occupy the ground.

Bermuda grass.—Bermuda grass is the most common lawn grass used in the Philippines; most of the extensive lawns about Manila have been planted with this grass. The method used is to plant it in rows about a foot apart and the plants about 4 inches apart in the rows. Bermuda grass makes a very satisfactory lawn. The variety growing in the Philippines is apparently different from the common form in the southern United States, in that it does not grow so tall. One other variety, known in Florida as St. Lucie grass, differs from ordinary Bermuda in that the stolons are underground instead of on the surface as in ordinary Bermuda. This form does not seem to occur in the Philippines, but may have advantages.

Korean grass.—This is a native grass growing near the seashore throughout the Philippine Islands. Excepting in the flowering head, it closely resembles Bermuda, but the leaves are of a paler green color. Near the seashore, at least, Korean grass is more aggressive than Bermuda grass, which it will crowd out in time. At the present date 90 per cent of the grass on the Luneta is Korean grass, although it is stated that this lawn was originally planted in Bermuda. Bermuda grass will apparently cover the ground more rapidly than Korean so that it seems advisable to plant lawns, when near the seashore, with Bermuda, even if the Korean crowds it out later.

In the United States Korean grass withstands the winter as far north as Connecticut, considerably farther north than the limit of Bermuda, thus indicating that the Korean grass is more hardy. It is not known how Korean grass will succeed in the Philippines away from the seashore, especially at high altitudes, but experiments are now being conducted with it at Baguio.

St. Augustine grass.—This is a coarser grass than Bermuda and the foliage is pale, like Korean grass; it is propagated in the same way, namely, by runners. In Florida it has been found to be a very satisfactory lawn grass in shady places and in very sandy soil. Plants of it growing at the Singalong experiment station show that it is perfectly at home in the Philippines. It is not to be recommended, however, where Bermuda or Korean succeed satisfactorily.

Lippia.—This is a small-leaved creeping plant much used in California as a lawn plant. A coarser-leaved variety is native in the Philippines. At the Singalong experiment station the California *Lippia* succeeds admirably and it is likely to prove very useful here, especially in situations where the other grasses will not succeed. It is a very low-growing plant with small heads of whitish flowers; so close to the ground that it rarely needs mowing; in fact, lawns of it can be allowed to go indefinitely without mowing.

Desmodium triflorum.—This is a native Philippine plant which grows very close to the ground, rarely exceeding 3 inches in height and usually shorter. In a general way it resembles white clover but the leaves are much smaller. Single plants will frequently make a circular mat 2 feet in diameter, the runners rooting at the nodes. In the West Indies pure lawns are sometimes made of this plant, but none have been seen in the Philippines. The *Desmodium*, however, finds its way into all grass lawns, growing among the grass without destroying it. On the Luneta the circular mats which it makes are very conspicuous because its

foliage is so much darker green than the grass. Except for this feature it is a desirable constituent of lawns. Where the lawn is Bermuda the colors are so nearly alike that the *Desmodium* is rarely noticeable.

Weeds.—The greatest trouble with lawns in the Philippines is the ingress of weedy grasses. Perhaps the most troublesome of these is nut grass, especially in wet ground. The leaves of this are fine, however, and in itself does not make a bad lawn. Mixed with Bermuda, or other grass, however, the contrast in the leaves is not pleasing. A few other coarse-leaved grasses occur commonly as weeds, and the only thing to do with these is to remove them bodily, preferably by cutting out the piece of sod and replacing with new sod. Chemical sprays, especially of sulphate of iron, are now used in Europe and the United States to destroy certain weeds in lawns. This can only be done where a strength of the solution can be found which will destroy the weeds without injuring the lawn grass. It is doubtful, however, if this can be made successful with either nut grass or the other weedy grasses which commonly grow in the Philippine Islands.

THE IMPORTATION OF CATTLE FROM AUSTRALIA.

By ARCHIBALD R. WARD, *Chief Veterinarian.*

The difficulties of controlling infectious animal diseases in the Philippines are greatly increased by the necessity of importing beef on the hoof. Filipinos demand freshly slaughtered beef, which commands a higher price than cold-storage beef, against which there is a strong prejudice. An unlimited amount of frozen beef is available for the foreign population of Manila, but this is not a factor which satisfies the requirements of the Filipinos.

The ravages of cattle diseases have made native beef scarce, hence, the necessity of importation. Somewhat over a year ago China and Indo-China furnished this supply of beef for Manila and near-by municipalities, but the requirements for combating animal diseases necessitated the application of restrictions against importation from China. These were so strict as to be practically prohibitive, and since then measures have been so strengthened as to make them absolutely so. These measures were the result of the experience of a decade in which it had been demonstrated that shipments of cattle from the China coast introduced foot-and-mouth disease and rinderpest with alarming frequency. The result of these restrictions gave Indo-China practically a monopoly in supplying beef cattle, and this consideration alone was a strong incentive to opening trade with Australia. The Philippines constitute a closer market to the stockmen of northern Australia than do the ports of southern Australia. Under these conditions northern Australia competed actively with Indo-China.

Importations from Australia had hardly begun when contagious pleuro-pneumonia was discovered at the matadero where these animals were slaughtered. This disease, owing to its insidious nature, is second only to rinderpest as a menace to the cattle industry of the Philippines, and necessitated prompt measures to prevent further exposure of our animals to the infection. The exclusion of Australian live cattle was neces-

sitated by reason of the lack of proper facilities for safely handling them in Manila. Under the conditions existing at the time it was necessary to drive the cattle from the water front to the owners' corrals scattered throughout the heart of the city. From these corrals they were of necessity driven through the open streets again to the Manila matadero. A few months later, when the construction of the Pandacan quarantine station had progressed far enough to permit occupancy by cattle, the situation was somewhat improved, but not enough to warrant allowing the importation of Australian cattle. The location of the quarantine station on the Pasig River permitted transportation direct to it from the ships by water. The danger of transmitting contagious pleuro-pneumonia was such that it was not deemed safe to allow Australian cattle in the quarantine station where they might infect animals destined for the provinces.

The prohibition of the admission of animals from Australia resulted in depriving Manila of its best source of supply of dairy cattle. Since this occurred, no dairy cattle from any source have been introduced into Manila, and the situation became very serious in view of the fact that dairy cows do not prosper in this city, and must be frequently replaced.

These conditions indicated the desirability of a most searching investigation of the animal disease conditions in Australia. Accordingly, Dr. Frank C. Gearhart sailed on July 30, 1910, for Australia, with instructions as follows:

You are hereby directed to proceed by first available transportation to Australia, and to visit all the principal States and ports thereof, for the purpose of investigating the conditions that prevail with reference to dangerous, communicable animal diseases.

This Bureau sincerely regrets that the recent importation of contagious pleuro-pneumonia (lung plague) has made it necessary to regard the importation of Australian cattle as dangerous.

The principal feature of your mission will be to determine the possibility of our obtaining healthy Australian cattle for immediate slaughter, and to determine to what extent the Australian Government, or the governments of the several States, are able to cooperate in this matter.

You will please determine from official sources, and otherwise, the distribution of contagious pleuro-pneumonia, and ascertain from what ports, if any, we may obtain clean cattle. You will please ascertain the extent to which the Inspector under the live-stock and meat export act of 1895 makes inquiry as to the state of health of live stock before certifying them as sound and free from disease.

I am handing you herewith copies of official correspondence and cablegrams relating to recent experiences with infected shipments from the port of Wyndham, West Australia, together with specimens of the lungs of such infected cattle. You may use these as the circumstances at the time seem to dictate, but in any event, before leaving, transmit to the Federal

Government of Australia the specimens together with copy of the telegram from the chief inspector of stock, dated Perth, July 22, 1910, and that from Mr. Baker, vice consul-general, dated Sydney, July 25, 1910, together with such papers as show our opinion as to the nature of the disease.

I would suggest that, if you have reason to believe there is a port from which we can get clean cattle, properly certified by the Government, you cable that fact.

Please render reports regarding the progress of your investigations as often as mail facilities permit.

I would suggest that you get copies of the books containing registry of brands of the different States of Australia.

Doctor Gearhart spent several months in Australia, Tasmania, and New Zealand. On his return he prepared an admirable report upon his investigations. Reduced to the shortest possible statement, his report showed that nowhere in Australia could there be obtained range beef cattle absolutely free from the danger of contagious pleuro-pneumonia. Dairy and breeding stock could be safely imported under very strict precautions, exercised with the assistance of the officials of the department of trade and customs of the Commonwealth of Australia. He received the most courteous attention from the Australian officials, who admitted the existence of the disease with the greatest frankness, and rendered him hearty assistance in his investigations.

From Doctor Gearhart's report it was concluded that if Australian beef cattle were to be imported for slaughter this must be done under conditions reducing to a minimum the danger of infection of local cattle with contagious pleuro-pneumonia. That no such facilities existed in Manila has already been pointed out. Owing to the absence of convenient and safe arrangements for importing and slaughtering cattle, Manila has earned the just reputation of being the plague spot of animal pestilences and the fountain-head of animal diseases in the Philippines. Obviously, the addition of another disease to those already common in the port would be a step backward. The urgent solicitation of would-be importers of Australian cattle, as well as the courteously expressed desire of the officials of the Australian Commonwealth—not to mention the demand for cheap fresh meat—pointed to the desirability of securing facilities in some place near Manila where the importation of animals for immediate slaughter could be allowed.

Through the courtesy of General J. Franklin Bell, negotiations were opened with the War Department, at Washington, with the view of obtaining a site for stock yards and matadero somewhere within the Mariveles military reservation.

His Excellency the Governor-General, by Executive Order No. 25 (series 1911), appointed a committee consisting of Mr. Ellis Cromwell, Collector of Internal Revenue; Mr. Fred M. James, chief of the division of sanitation and transportation, city of Manila, together with the writer, for the purpose of considering a site. The committee was charged with the duty of coöperating with the representatives of the Commanding General, Philippines Division, agreeing upon a location for the matadero, and preparing alternate plans for the construction and operation of such matadero; first, as a private enterprise; and second, as a Government institution. In company with the board appointed by the Commanding General, which consisted of Major Chamberlain, Captain Prentice, and Lieutenant Booth, a visit was made to Sisiman Bay and a site satisfactory to all parties was selected. A suitable piece of land approximately 304 by 365 meters was reserved near the barrio of Sisiman on the bay of that name, near the stone quarry of the Atlantic, Gulf and Pacific Company. This site for the stock yards is connected with the water front by a strip of land sufficiently wide to provide access thereto and to provide a site for the matadero on the beach. The bay offers excellent harbor facilities for discharging cattle and is so located as to afford protection against prevailing winds. The committee appointed by His Excellency the Governor-General recommended that the stock yards and matadero be constructed by the Government and be run as a strictly Government enterprise. This arrangement absolutely assured equal terms to all importers of cattle from Australia and was adopted notwithstanding the fact that one importer offered to construct the necessary yards and buildings at his own expense. The committee further recommended that the fees for slaughtering animals at Sisiman Bay should be the same as those imposed in the city of Manila, in order that there be no discrimination against Manila in the matter of the municipal matadero fee of 3 centavos per kilo. It was further recommended that the importers of meat be responsible for the transportation of same from Sisiman Bay to Manila, in view of the possible disputes that might arise as to whether or not it would be safe to navigate Manila Bay on certain days during the typhoon season.

In order to permit the resumption of the importation of cattle from Australia for slaughter, General Order No. 2, series 1911-12, appearing on page 534 of this number of the REVIEW, was issued.

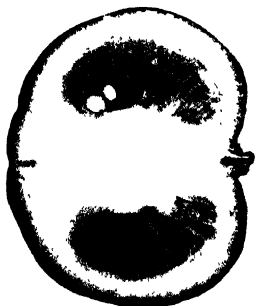
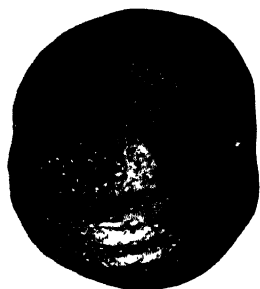
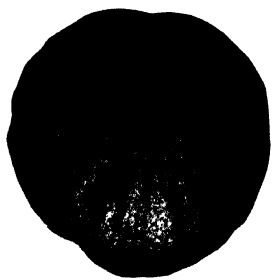
In view of the great urgency of the demand for fresh meat, the construction of the plant was begun by the Bureau of Public

Works under rush orders, and the shipment of cattle from Australia was timed with reference to their arrival at Sisiman at the earliest practicable moment that corral space would be available for them. In the absence of the matadero, which was in course of construction, for a few weeks slaughter was carried on on board a lighter. At the present time the whole plant, with the exception of a wharf, is completed and in operation.

There are two corrals about 101 by 244 meters, subdivided into smaller areas, and provided with tank, watering troughs, feeding sheds, and storehouse for fodder. The corrals, situated some little distance from the shore of Sisiman Bay, behind the barrio of Sisiman, are connected with the water front by a lane. The whole area occupied by cattle is surrounded at a distance of 30 meters by a barbed-wire fence, sufficiently strong to keep out wild animals. The matadero, 15 by 42 meters, with cement floor, is situated on the beach. Cattle are discharged from the ship by swimming and are guided to the shore by two lines of floating logs, fastened end to end, which act as a fence. The completion of a pier will enable the cattle to be discharged by means of lighters if this is found to be more desirable.

During the first month of operation 923 head of cattle were slaughtered. On one occasion, one day's kill of meat was spoiled because typhoon weather prevented the steamer from going after the meat.

In accordance with information gathered by Doctor Gearhart in Australia, and in accordance with arrangements made by him with the Australian Government, it was deemed safe to permit importation of Australian breeding and dairy cattle under the terms prescribed in General Order No. 1, which appears on page 532. This has made possible the establishment of dairies in Manila provided the managers succeed in avoiding the many perils which threaten such enterprises in the Philippines.



(Photograph by O. W. Barrett.)

PLATE II — "SUA" (*Citrus* sp.)

TROPICAL FRUITS IN THE VISAYAS.

By P. J. WESTER, *Horticulturist*.

During the spring campaign against rinderpest, the Philippines Coast Guard cutter *Luzon* was placed at the disposal of the Bureau of Agriculture for a trip to the southern islands, the vessel being scheduled to touch at several points which are difficult of access by the regular steamer lines. Recognizing the unusual opportunity to get a horticultural "bird's-eye-view" of the islands to the south of Luzon, the Director of the Bureau instructed the writer to accompany him during part of the trip, for the purpose of collecting data on the status of fruit growing at the points visited, and to obtain some information relative to the comparative richness of the pomological flora in these islands. The object in this was to enable the Bureau to determine where horticultural exploration work may be prosecuted most profitably in this part of the Archipelago in the future, and to plan for such other work as would tend to encourage a more general cultivation of better varieties of fruits than are now grown. The party consisted of Dr. G. E. Nesom, Director of Agriculture; Messrs. O. W. Barrett, chief of the division of experiment stations; M. M. Saleeby, fiber expert; D. B. Mackie, agricultural inspector; C. V. Piper, Agrostologist of the Bureau of Plant Industry, United States Department of Agriculture; Mrs. Piper, and the writer. The *Luzon* left Manila, April 15 and arrived at Cebu the 17th.

Short trips were made, by land, from Cebu to Danao, Carmen, Argao, and Carcar, from which place the other members of the party proceeded across Cebu to Barili to meet Doctor Nesom on the *Luzon*. Returning from Barili to Cebu to coal, stops were made at Bosac and Bais, Oriental Negros.

The itinerary from Cebu to Tacloban, Leyte, included stops at Dapitan, Zamboanga; Oroquieta and Misamis, Misamis; Camp Overton, Zamboanga, from which place a visit was made, overland, to Iligan; Cagayan, and Mambajao, Misamis; Butuan and

Cabadbaran, Agusan; and Surigao, Surigao, at which points stops were made of longer or shorter duration. An interesting day was spent in Tacloban and vicinity, after which the steamer proceeded to Catbalogan, Samar, and to Pulupandan, Occidental Negros, where the *Luzon* was dismissed. Three days were consumed at the Bureau's experiment station in La Carlota, Occidental Negros, after which the party proceeded to Iloilo on a small interisland steamer. After a six days' stay in Iloilo, devoted to exploration trips in the surrounding country, including a journey to Capiz by rail, Messrs. O. W. Barrett, M. M. Saleeby, D. B. Mackie, and the writer returned to Manila, May 11. The trip was attended by most favorable weather conditions.

The interisland voyage, with its beautiful and ever changing scenery, the islands covered with a tropical vegetation that speaks volumes for the wealth of the soil, was a revelation to the writer and the source of great pleasure and unmingled enjoyment. Were it not for the remoteness of the Philippines from western civilization the inland sea of the Archipelago would long ago have been one of the beaten paths of the tourist. He daily invades new territory and the writer ventures to predict that no sooner do the beauties of the interisland voyage become better known than it will be one of the tourist routes of the world.

But, if the natural beauty of the Islands compels one's admiration and the signs of the latent agricultural resources fill one with wonder, the failure of the inhabitants, at large, to more than eke out a bare living and the crude methods employed in the culture of the main crops of the Islands and the conversion of the natural products into food, or into articles of commerce, show the backward condition of the development of the Islands and their industries no less strikingly, and to those who have seen the resulting prosperity in other parts of the world of the same industries properly developed, there is a vision of the wealth and prosperity that is due when the Philippines once come into their own.

Fruits are abundant throughout the year in the tropics, or should be, but there is a distinct lull here in the fruiting season between April 1 and May 15, the season of the citrus fruits, the orange, tangerine, and pomelo has closed; the lime and lemon have not yet reached maturity; a limited number of mangos are found in the market, commanding good prices, but the bulk does not arrive until late in May and June; only a few belated custard apples are in evidence and the sugar apple is only just in bloom. The soursop is the only cultivated species

of the genus *Anona* that matures fruits during all seasons of the year, and they are, during the spring, only sparingly produced. The guaya is mainly a summer fruit, and excepting the macopa, which is now ripening its fruits, and the early fruit of the duhat, also in season about May 1, the other related species, the yambo and pitanga, ripen their fruits later. The cashew is at its best and a few chicos are marketed, but they mature mainly during the summer; the lanzones do not ripen until in the autumn, and the jack, as well as the nearly related breadfruit, are mostly only half grown. The banana, of which fruits of the various varieties are found in the markets in the different towns in the Archipelago at all seasons of the year, is an exception as is also the papaya.

For this reason very little opportunity was given on the trip to test many of the fruits that grow in the Philippines, and to reach a conclusion as to the merit of the different parts of the Islands for the production of certain fruits. In fact it is very doubtful if the results of such a test would accurately indicate the adaptability of certain fruits to one locality or that another is unfavorable for its production, this for the reason that no intelligent care is accorded the fruit trees; presumably little attention is paid to selection in planting seed, and budding and grafting are unknown. Fruit growing, as an industry, can scarcely be said to exist; the fruit trees are growing, a few of each kind, about the houses of the inhabitants, invariably set too close or planted along the roadsides or edges of the rice fields, on hillsides or in ravines, where the land is untillable. The writer obviously did not have the opportunity to see all there was in the islands visited, but the notation of only one regularly planted fruit orchard seen during the trip probably well illustrates the condition of the fruit industry in the Philippines.

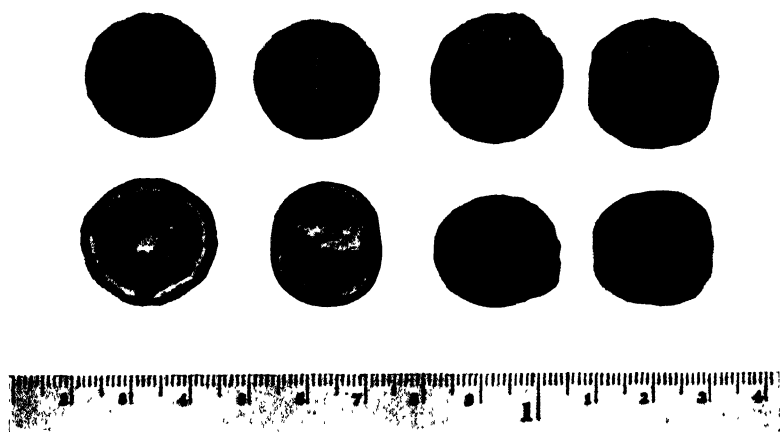
The only fruit tree whose product forms a staple article of export from the Philippines is the coconut (*Cocos nucifera*) and there are probably few towns in the Archipelago on the seaboard where this tree is not planted. The itinerary of the trip did not include any point where the growing of coconuts is an industry of importance, but small groves were passed, here and there, on the road from Cebu to Carmen and also seen in Dapitan, Cabadbaran, and Iloilo. The trees do not produce to the full extent of their capacity on account of too close planting. Barring the presence of the coconut beetle the trees appear to be remarkably free from insect pests. The coconut does not usually produce fruit until the trees are 7 to 8 years old, but a peculiar dwarf variety was met with in Misamis that is claimed to fruit

when only 4 years old. (See Plate I.) The fruits are considerably smaller than the ordinary nut, with a somewhat thicker flesh.

Cacao (*Theobroma cacao*), so important a crop in certain parts of the tropics, has never developed to an industry in the Philippines, and yet some parts of the Archipelago are undoubtedly well adapted to its culture. The cacao requires, to succeed, somewhat more attention than is bestowed upon fruit trees by the average planter in the Philippines, and this was well attested by the appearance of the specimens, seen here and there during the trip.

The banana (*Musa* spp.) is found universally planted in all places that have been visited. The house is indeed rare, in the yard of which does not grow one or more clumps of bananas, but those grown are mostly inferior varieties. It is a remarkable fact that in only two places, Iloilo and the near-by town of Jaro, there were found in the markets fruits of the "Chinese dwarf," a variety that has no superior in the Philippines and is one of the best varieties in existence. Aside from the superior quality of its fruit, and its greater productivity than that of the kinds usually planted, the dwarf habit of the plant, enabling it to better withstand the violence of the typhoons than the varieties commonly grown, should recommend it to the planter.

Of the citrus fruits, the pomelo, or "lucban" (*Citrus decumana*), the tangerine, or "narangita" (*Citrus nobilis*), the "cabuyao" (*Citrus torosa*), the orange, or "cajel" (*Citrus aurantium*), the lemon, or "limón" (*Citrus limonum*), and lime, also called "limón" (*Citrus limetta*), are planted with frequency in the order enumerated; the pomelo is found about evenly distributed in the points visited and invariably the trees observed were vigorous and thrifty, considering the absence of care and attention; two types exist one white fleshed and one whose flesh is more or less pinkish, with an exceedingly great variation in form, from roundish oblate to a very distinctly pyriform fruit; the presence or absence of pubescence noted on the young twigs of the trees of this species is probably correlated to other distinctive characteristics in the fruit. The tangerine is somewhat less extensively planted than the pomelo. This species was found in greater numbers in Tacloban, Palo, and Tanauan, Leyte, than at any other point. Samples of the fruit were obtained only at Mambajao, those being markedly larger than tangerines generally found in the market in Manila, and of fairly good quality. Wherever trees of this species were observed they appeared to be perfectly at home. Next to the



(a)



(b)

PLATE III — (a) 'SAMUYAO' (*Citrus* sp.) (b) 'PANGI' (*Manifera* sp.)

tangerine, the cabuyao seems to have a place in the affections of the native population. This is a very vigorous tree and, while the fruit seems to be of little value, it may, on trial, prove to be a very desirable stock for the cultivated species. The lemon is planted rather rarely and to a less degree the orange; the lime is but seldom seen and the citron exists only in the gardens of the more well-to-do. In Tacloban, Leyte, and Catbalogan, Samar, excellent fruits of the calamondin (*Citrus mitis*) were obtained, juicy and pleasantly acid. This fruit, under cultivation, might develop to a very good "ade" fruit, but it is now very little grown. A fruit called "suâ", used by the natives in cleaning clothes, was offered in the markets of Cebu and Tacloban and it was also seen in Misamis. The fruit is very distinct from all other citrus fruits and is best described as a small, oblately flattened citron, prominently ribbed longitudinally, and is possibly a variety of *Citrus medica*; it appears to be almost unknown outside the Visayas. (See plate II.) The samuyao is an unidentified, small, round, citrus fruit with a wrinkled surface and a conspicuous dent at the apex, about 25 millimeters in diameter, found in the market of Cebu, also very distinct in appearance from other known citrus fruits; it is used by the Filipino women in washing their hair and in making a pomade.

Perhaps nothing illustrates better the condition of the citrus industry in the Philippines than the fact that California oranges are sold, not only in Manila, but in Iloilo and Cebu. In these places, as well as in the small town of Catbalogan in Samar, Sicily lemons were for sale in grocery stores, and yet there is scarcely room for doubt that good lemons can be cheaply produced in the Islands.

Considering the attention they receive, the citrus trees in all parts of the Archipelago appear to be thrifty, vigorous, and free from scale insects to a remarkable degree. With the introduction of scientific methods of culture, Porto Rico, having a climate similar to that of the Philippines, produces a very superior orange and pomelo, and it seems, therefore, reasonable to believe that the orange, as well as the other citrus fruits, may in the future not only be produced here for home consumption, but also for export to Japan, Australia, and the mainland of Asia.

The mango (*Mangifera indica*), so extensively grown in several provinces in Luzon, is rather sparingly planted in the southern islands. No trees of this species were seen in Catbalogan, though they are probably planted farther inland, and there were notably few in Tacloban, otherwise so rich in fruits, and at several other points. Even in Cebu the mango is not planted as extensively as

in certain districts in Nueva Ecija, Bulacan, and Cavite, though Cebu mangos form an article of export during the fruiting season. The mangos examined in Cebu were of the same general character as the carabao variety in Luzon and fully equal to them in flavor and quality. Seemingly perfectly at home on the eastern shore of Cebu, the almost total absence of the mango in the interior, in going from Carcar to Barili, was striking. The neighboring island, Bohol, is said to produce considerable quantities of mangos. Mango trees of the type referred to are scattered through the country around Iloilo and adjacent towns and are seen here and there from the railway going from Iloilo to Capiz on the north shore of Panay. The general character of the mango trees in Dapitan would seem to imply that they are a type different from those noted elsewhere in the Philippines. In the market of Cagayan, mangos of the type known as "pahutan" in Cavite, were sold under the name of "paho." The "pangi" mango, an unidentified relative of *Mangifera indica*, of which a few specimens were obtained in Iloilo, is a tall upright-growing tree with comparatively smooth trunk and small, greenish fruits, the pulp very resinous and distinctly flavored, gelatinous, rather fibrous and having a large seed. Experiments may show this to be a desirable stock for the mango, but the fruit does not seem to possess any characteristics that might, to advantage, be imparted to the mango by hybridizing the two species.

The breadfruit (*Artocarpus* spp.) is very generally grown in Tacloban and the places visited in Occidental Negros and Iloilo; in fact, it appears to grow wild along the roadsides. It grows luxuriantly in the Visayas wherever planted, but is not generally grown except in the places mentioned. However, the trees appear to be almost exclusively of the poorer kinds that are propagated from seed, the natives evidently not knowing how to propagate the seedless variety. It is probably safe to say that the introduction of the twenty or more Polynesian varieties into the Philippines would prove of greater value to the Archipelago than the introduction of the same number of kinds of any other food plant. The jack (*Artocarpus integrifolia*), a species closely related to the breadfruit, seems to be a general favorite in Tacloban and adjacent towns, in La Carlota and Pulpandan, and is also planted to a considerable extent in Dapitan, where a fruit was obtained that weighed approximately 25 kilos. The prevalence of the breadfruit in Iloilo and its luxuriant growth there has already been commented upon. It was, therefore, surprising to see its near relative, the jack, thriving

under the same conditions, so seldom grown in that locality. In Catbalogan not one specimen was seen.

The papaya (*Carica papaya*) is planted very universally throughout the islands visited and its growth is all that can be desired; but the variety grown is mostly a degenerate, dioecious type, the fruit of which is almost universally small and seedy and of very poor quality.

Three species of the genus *Anona* are grown in the Philippines—the soursop, or “guanabano” (*Anona muricata*), the sugar apple, or “ates” (*Anona squamosa*), and the custard apple, or “anona” (*Anona reticulata*). Of these the soursop in many places appears to be the favorite in the Visayas, markedly so in Tacloban and neighboring towns where the other species are rare. In Iloilo the sugar apple is very common while the other species are less in evidence; the custard apple seems everywhere to be less esteemed than either the soursop or the sugar apple. All species luxuriate wherever seen and the sugar apple and the soursop are abundantly productive. The fruitfulness of the sugar apple is due to the presence of certain species of *Coleoptera* that abound in the Philippines and which pollinate the flowers of this species. In Florida the writer found the same species of *Coleoptera* act as pollinizing agents for both the sugar apple and the cherimoya (*Anona cherimolia*), and with the species noted here it is, therefore, probably safe to predict that the cultivation of the cherimoya, the most esteemed species in the genus and one of the most famous of the tropical fruits, recently introduced into the Philippines by the Bureau of Agriculture, will be successful.

The sapodilla, or “chico” (*Achras sapota*), is not universally planted, perhaps for the reason that it is of slow growth and more tardy in the production of fruit than most other tropical fruits, few being seen outside of Tacloban, Iloilo, Cebu, and Argao, at which last point they are grown to considerable extent. The fruits are, in general, of good quality but very small. A rather inferior pineapple, “piña” (*Ananas sativus*), is found widely distributed in the southern islands, appearing here and there to naturalize itself. Cultivated fields of this species were nowhere noted during the trip. Many mangosteens (*Garcinia mangostana*), 10 meters tall, in prime condition and in full bloom, were encountered in Dapitan, where this species appears to be perfectly at home. No mangosteens were observed north of Mindanao. In only two places, Dapitan and Argao, were lanzones (*Lansium domesticum*) found planted in any considerable numbers. The introduction of this species into new territory

appears to proceed very slowly. North of Mindanao the durian (*Durio zibethinus*) is seldom, if at all, grown and it is rare even in that island. The ciruela (*Spondias purpurea*) is well esteemed by the native and is, in some localities, planted in considerable numbers; in fact the only fruit orchard worthy of the name seen during the trip, at Pulupandan, consisted of ciruela trees. The bilimbi (*Averrhoa bilimbi*) is very generally grown throughout the south and seems to bear well. Its relative, the carambola (*Averrhoa carambola*), a much larger fruit, is rather scarce. The guava (*Psidium guajava*) has naturalized itself throughout the region visited. The duhat (*Eugenia jambolana*) is scattered throughout the Visayas, and its near relative, the macopa (*Eugenia javanica*), a far inferior fruit, is quite generally planted everywhere—possibly because of its attractive appearance. The cashew, or “casoy” (*Anacardium occidentale*) is not generally grown. The tamarind, or “sampaloc” (*Tamarindus indica*), at once graceful and majestic, is a conspicuous object in most places, but does not appear to be very fruitful. The yambo (*Eugenia jambos*), and the macopa (*Eugenia malaccensis*), are, perhaps, less grown in the southern islands than any other fruits introduced. The santol (*Sandoricum indicum*) and the mabolo (*Diospyros discolor*), both species indigenous to the Philippines, are found throughout the region visited.

Inseparable from the Philippine villages in the Visayas, no less than in Luzon, is the betel-nut palm, or “buñga” (*Areca catechu*), the fruit of which is of considerable local commercial importance, being extensively used as a stimulant by the Filipinos. The date palm (*Phoenix dactylifera*), so important in Northern Africa, Arabia, and adjacent countries, has scarcely been introduced into the Philippines; the only specimens of this species seen during the trip were found in Iloilo. As far as known, the date has never fruited in the Archipelago.

The grape (*Vitis vinifera*) and the fig (*Ficus carica*) were both introduced by the Spaniards and the grape is reported to succeed fairly well in Cebu. Unfortunately the writer did not have the opportunity to visit any of the vineyards and examine the vines. Fig trees exist in the gardens of wealthy Spaniards in Bais and Misamis, and probably elsewhere, but judging from fruits tested, it is doubtful if this fruit can be cultivated to advantage in the Philippines; the fig being a fruit of the temperate zone, this is, in fact, scarcely to be expected.

Aside from the data gathered, a very complete collection of seeds of the genus *Citrus* was secured that will be used in connection with the testing of different stocks for the cultivated

varieties of the orange, tangerine, pomelo, and lemon; an interesting miscellaneous collection of plant material of economic and ornamental plants was also brought to Manila.

It does not appear, from the observations made, that the presence or absence in certain localities of certain fruits is a reliable guide in regard to the adaptability, or vice versa, of a certain species to that locality. It shows, perhaps, rather a preference in a certain locality for a certain fruit, and also which were the first kinds introduced there; it indicates probably also the inaptitude of the natives to take hold of a new thing, clinging to early introductions in preference to more recent ones.

Most, if not all, of the cosmopolitan fruits referred to above have been introduced into the Philippines by the Spaniards—a not inconsiderable number of species, but there are many species absent that one might expect here after the long dominion of the Philippines by a once great European power with colonies in all parts of the tropics. Yet the situation in the Philippines in this respect, is, perhaps, not very different from that in many other tropical colonies.

Exceedingly few cultivated varieties of the genus *Citrus* have been introduced into the Philippines, and those so recently that their worth has not yet been established.

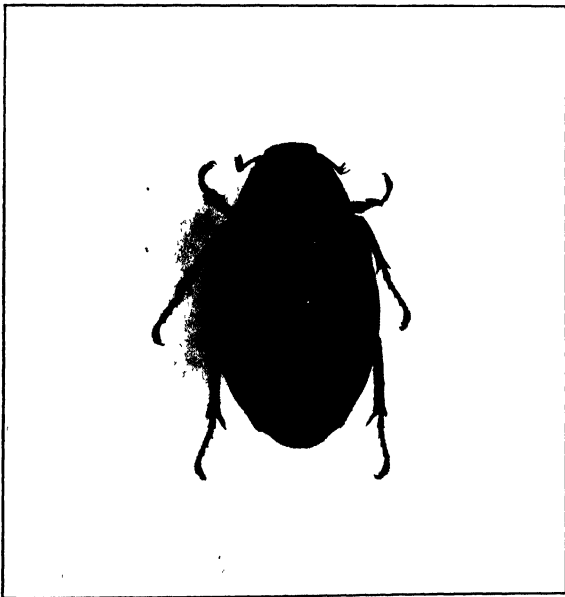
In the introduction of the mango—the fruit of which from the best types in the Philippines is of unsurpassed excellence, even superior in flavor to the East Indian varieties introduced into Florida that have fruited so far, and closely approaching them in their freedom from fiber and in their small seed—the Philippines have been more fortunate than any other part of the tropics where the seedling types mostly produce small fruits, inferior in flavor, very fibrous, and with a large seed. Unlike the East Indian grafted monoembryonic mangos which fail to do so, the polyembryonic mangos of the Philippines reproduce themselves practically true from seed. Fortunate in the introduction of the mango, the reverse is the case in the pineapple, only one mediocre variety having come to the attention of the writer, and no time should be lost in introducing the several superior varieties that are cultivated in Florida, the West Indies, Hawaii, and Singapore. The avocado (*Persea gratissima*), destined to become one of the great tropical fruits of the world, the asexual propagation of which has been solved in Florida within the last ten years where large budded orchards are now being rapidly brought into prominence, has never gained a permanent foothold in the Philippines until introduced by the Bureau of Agriculture a few years ago, and no trees of this

valuable fruit are planted in the Visayas, where apparently everything is favorable for their growth. The rapidity with which the seed deteriorates, making difficult its safe transportation to countries distant from its natural habitat, is responsible for this and partly explains the absence, until recently, of this species in the Philippines; but the failure to have introduced the cherimoya from Peru, Mexico, and Chile, the seeds of which are so easily transported, seems almost criminal negligence in view of the fact that three other species of the same genus, with vastly inferior fruits, have been imported and are flourishing. *Bertholletia excelsa*, the well-known "nigger-toe" nut from Brazil, the sapote blanco (*Casimiroa edulis*), also ceriman (*Monstera deliciosa*), the only aroid in the world that produces an edible fruit and that of great excellence, almost entirely seedless; the feijoa (*Feijoa sellowiana*), the culture of which, in California, is rapidly attaining considerable proportions and which is successfully cultivated in southern France, the tiess (*Lucuma rivicoa*, var. *angustifolia*), and many other species, are still waiting to be introduced into the Philippines from the Western Hemisphere, as is also the hevi (*Spondias dulcis*), now introduced into many parts of the tropics from its home in Polynesia. It is almost inexplicable how the roselle (*Hibiscus sabdariffa*) has escaped introduction from Malayasia and Indo China, and yet not more so than the no less remarkable absence of several species of *Nepheliums* and other fruits that are found in the Malay peninsula, Java, and adjacent islands. No fruit of African origin seems to have yet been introduced into the Philippines.

Sugar, copra, hemp and rice are, perhaps, destined to always be the great staple crops of the Philippines, and, in time, the cacao should become of considerable importance; but the soil, climate, and the geographical position of the Archipelago, with Manila as one of the great shipping centers of the Far East and its proximity to Hongkong, Shanghai, and the ports of Japan, with the heavy passenger traffic passing through these ports, are such as to insure a very substantial income from the production of fruits, if this industry is properly developed, and in this the Visayas should have a very considerable share.



(a)



(b)

PLATE IV — (a) LARVA OF CANE ROOT BEETLE (*Holotrichia vidua* Sharp) (b) CANE
ROOT BEETLE (*Holotrichia vidua* Sharp)

SOME NOTES ON AGRICULTURAL PESTS.

By DAVID B. MACKIE, *Agricultural Inspector.*

During the month of April I was detailed to join a party composed of the Director of Agriculture and several members of his scientific staff, who were making a survey of the southern islands. The principal object of this survey was to ascertain certain facts relative to the rinderpest situation, and as the object of my investigations was to secure material pertaining to agricultural pests, the latter work was necessarily subordinated to that of the veterinary section, and only such data as could be secured by casual observation were obtainable.

As the time available in each place was so limited, it was decided, in outlining the work, to confine our attention to some of the more important crop pests and pay most attention to their distribution and prevalence in the different localities visited. Among the different crop pests those affecting mango, banana, citrus fruits, coconuts, and sugar cane were given attention.

The first locality visited was the east coast of Cebu, including the district bounded by Carmen on the north and Argao on the south. As the mango is one of the important crops in this region, special attention regarding the presence or absence of the insect pests affecting it was given. In the Danao district the mango web-worm was found to be very prevalent. The webs made by these insects are large and rangy, sometimes being over a meter in diameter and are generally spun about the terminal twigs; along the twigs and leaf petioles, which are inclosed by the web, are silken tunnels or passages over which are distributed particles of cut leaves and excrement. In these passages the larvae spend their time during the hotter part of the day. As the age of the brood increases the web is made larger and the number of passages increased until, as they reach maturity, the web has a ragged and unsightly appearance, which greatly injures the natural beauty of the tree. The caterpillars of this species are rather small, measuring a little over one

centimeter in length and yellowish green with darker markings, especially in the anterior parts; they spend the larval and pupal states within the web. From the fact that the insects live in colonies, it seems the egg mass is deposited on the twig by the female moth.

Compared with the above, the other mango pests were of minor importance; various scales were noticed on the leaves and branches and specimens secured for identification. A notable feature was the absence of two species of insects that are the cause of the greatest damage to the mango crop in Luzon. The more important of these two is a small leaf-hopper, probably an *Idiocerus*, which lays its eggs on the flower panicles of the mango trees and during the entire larval stage the insects suck the juice from the tree, and at the same time excrete a sweet, sticky substance upon which the ants feed, and protect the hopper for this reason.

Due to the operations of these insects the tree is unable to set fruit and the result is that it bears about 1 per cent of the normal crop. The other pest is a fruit-fly, which stings the fruit, causing it to fall, the fly emerging from the decayed fruit. While quite serious, this pest does not nearly equal the former in importance.

Of the pests affecting other crops the only one that was noticed was the bag-worm infesting the banana plants in the vicinity of the municipality of Cebu. While the extent of infested territory was very limited, yet in some places the leaves were simply riddled with holes. The damage appears to be done by three species—two smaller and one very large. The bag made by these insects is of silk, to which are attached small pieces from the leaves of the host plant. The bag is carried about by the insect until it becomes too small, when a new one is spun. It looks much like a curled-up leaf and serves its purpose of protection very well. The bags of different species vary; some are entirely of silk, while others are mixed with pieces of vegetable matter. This is the first time that the bag-worms have been noticed in colonies here; they are nearly always more or less solitary in their habits. As only one day was available for investigation in the vicinity of the railroad south of Cebu, no collecting was done. The following morning was spent in crossing the island from Carcar to Barili. With the exception of a few corn fields, comparatively little of the land in the immediate vicinity of this road is under cultivation. At Barili it was noticed that the fruit on a majority of the lukan (pomelo) trees was attacked by some small insect, evidently a species of *Lepidoptera*, which bored into the thick rind and spent the larval stage in the spongy part between the rind and the pulp.

It was impossible to secure specimens of these insects, as they had all developed and left the fruit. Affected fruit may be noticed by the wart-like protuberances on the rind. In view of the fact that this insect does not attack the flesh of the fruit, the damage done is not of great importance, as all the fruit is consumed locally and by people who pay little attention to such things.

At noon we were picked up by the Coast Guard cutter and proceeded directly to Bosoc in Oriental Negros, where a stop of a few hours was made. Here no pests of any importance were reported, excepting a few rhinoceros beetles in the coconut trees. The next day the cane fields in the vicinity of Bais were visited. The *hacenderos* reported slight damage from the cane root beetle and also some from tip-borers, etc. One noticeable feature in this district was the presence of large flourishing coconut groves in close proximity to sugar-cane fields, though it is claimed by planters in many districts that to grow the two crops successfully is impossible, owing to the "uang," or rhinoceros beetle, breeding in the sugar-cane rubbish. On what grounds they base their conclusions it is impossible to say, but from the condition of the crops in this district, it seems only a question of keeping the "bagasse" well cleaned up so as to afford no breeding-place for the larvæ.

On leaving Bais, the party touched at Dumaguete that night and sailed back to Cebu for coal.

Mindanao: After twelve hours stop at Cebu the party sailed arriving in Dapitan the following morning. Here everything seemed to be in good condition and few pests were noted, except fruit-flies in the citrus fruits. This condition prevailed along the entire north coast of Mindanao and at Misamis the banana-leaf roller was noticed, this being the first time it had been seen on the trip. It was also noted that individuals were carrying numerous cocoons of small ichneumon flies which probably accounts for the scarcity of this pest, its control being effected by these parasites. Here also it was observed that the citrus fruit trees formed the host plant for a species of mistletoe (*Loranthus secundiflorum*), which in many cases caused the death of the trees. In affected trees the dark, brush-like growth of the parasite can be readily seen; it is generally more or less spherical in shape with dark, glossy, green, ovate leaves. Should this plant become introduced among the citrus groves of Luzon it might, in time, develop into a rather troublesome pest.

At Cagayan, Misamis, the indications pointed to a good crop of coconuts with little loss from the rhinoceros beetle. A new

caterpillar was noticed attacking the lemon trees, which although of merely local distribution, was nevertheless very abundant where found. This insect feeds upon the leaves and rolls them up for protection during pupation, the small black pupa being found within the curled leaves.

At other places visited, including Oroquieta, Butuan, Agusan, Cabadbaran, Mambajao and Surigao, generally good conditions prevailed. From Surigao the journey was continued to Leyte where Tacloban, Palo and Tanauan were visited. Here a general survey showed no particular pests and conditions seemed favorable to good crops. Catbalogan, Samar, was the next place called at; as there is very little agriculture carried on in this district, only a casual survey was made.

The following day the party was landed at Pulupandan, Occidental Negros, and proceeded to La Carlota. At La Carlota experiment station four different pests were found to be attacking the growing cane. The one responsible for the greatest loss is the cane root beetle (*Holotrichia vidua* Sharp). This insect spends the larval stage beneath the ground feeding upon the roots of the sugar cane. The mature beetle is large and smooth, and a fair opinion of its size can be obtained from the illustration. The mature beetles fly about during the night and are attracted to lights. This insect is one of our most important pests, and throughout the La Carlota district whole fields have to be abandoned because of its operations. Among the other insects affecting cane was a small red weevil (*Sphenophorus* sp.) which spends the entire larval and part of the adult stage in boring through the heart of the cane, generally confining its operations to the base of the stalk. These galleries are extensive and in them the white grub pupates and later, after a period of six to nine days, transforms into a red weevil; it appears to spend most of its time in the cane, coming to the surface to mate. Several different moth borers were found in the upper part of the cane. One species confines its operations to the tips of the stalks, while another seems to work in the middle internodes. These borers, which are evidently some species of *Piralidæ*, are very numerous in some parts of Negros.

At Iloilo little time was available for investigation and the few days there were spent in general observations in and around the city. Only one thing worthy of mention was noted here, this being the presence of leaf-hoppers on the mango trees; because of their attacks the same inability to set fruit was noticed.

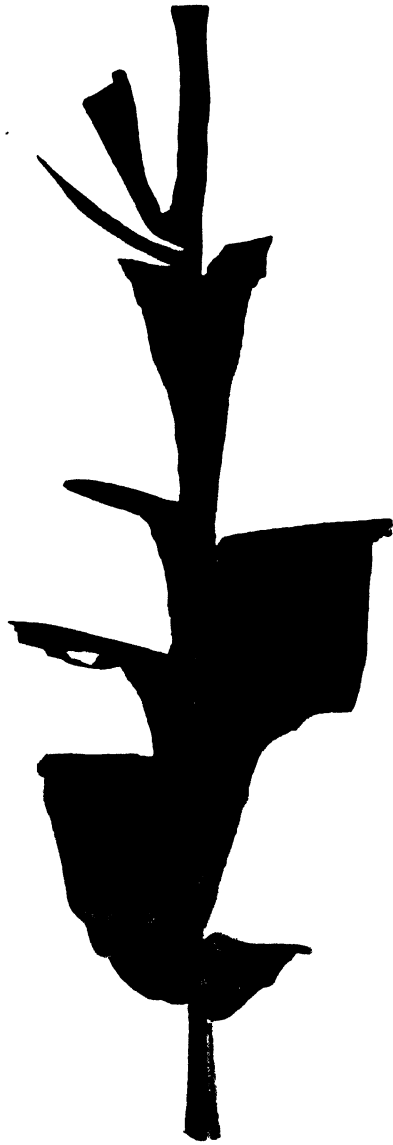


PLATE V. BANANA LEAF ATTACKED BY BANANA-LEAF ROLLER (*Eriomota jiar*)

THE FIRST ANNUAL CATANDUANES LIVE-STOCK EXHIBITION.

By Dr. F. C. GEARHART.

Much credit is due the progressive people of Catanduanes for the very successful live-stock exhibition which was held at Virac, July 4 to 7, inclusive. This is the first important live-stock exhibition ever held outside of Manila, and the people responsible for its success are to be heartily congratulated.

The following officers were elected by the central committee which was appointed by Lieutenant-Governor Señor Felipe Usero: President, E. H. Koert, Bureau of Agriculture; vice-president, Eustaquio Joson; secretary, Severiano Talión; treasurer, Capt. Pedro Arcilla.

The other members of the central committee were Señor S. Velez and Señor Fidel Abella. Señor Braulio Tapullar and Señor Eusebio Tejada also rendered valuable aid.

The exhibition opened on the morning of July 4 with a civic parade, which terminated in a fine agricultural park which has been prepared by the people of Virac. Four thousand five hundred people witnessed the coronation of the queen, Señorita Josefa Francisco, and listened to a very fine address by the Hon. Silvino Brimbuela, Assemblyman for the district. He explained the significance of the day as a national holiday, discussed the importance of the exhibition and the many advantages to be gained by the improvement of the live stock in the island, and explained how this improvement could be brought about. Señor Brimbuela took a great interest in the exhibition. He acted as judge, assisted by Señores Julian Pascua and Felipe Usero, and otherwise aided the committee in making the undertaking a success. The distribution of the premiums was made by the queen, assisted by her ladies in waiting, Señoritas Catalina Victoria and Feliza Francisco. Funds were secured by subscriptions, by the sale of votes for the election of the queen, and by a contribution of ₱90 from the provincial board of Albay. Some of the premiums were: From the International Chamber of

Commerce of Albay, ₱25; Judge P. N. Moir, ₱10; *El Heraldo Bicol*, ₱10; La Rosa Cigarette Factory, a valuable silver cup; Germinal Cigar and Cigarette Factory, ₱25 in merchandise; and from the Society for the Prevention of Cruelty to Animals, 12 bridles, 6 bits, and valuable literature.

It is estimated that 17,000 persons attended the exhibition. Much enthusiasm was in evidence and the people all returned to their homes resolved to raise better live stock. There were exhibited 620 stallions and mares, 64 cattle, 35 carabaos, 18 goats, 14 swine, and 37 chickens.

A show committee for the coming year has been organized and is already preparing for the second annual exhibition.

MONTHLY VETERINARY REPORTS—AUGUST AND SEPTEMBER.

Albay and Ambos Camarines.—Reports of disease have been received from a few municipalities in these two provinces. Mr. B. C. Ray, assistant agricultural inspector, sailed on September 7 for Sorsogon, Albay, and Ambos Camarines to investigate the situation and suppress any disease he might find there.

Bataan.—Rinderpest prevails in the municipalities of Orion and Pilar.

Bulacán.—There is some infection in the municipalities of Calumpit, Malolos, and San Miguel. The force of employees in this province is keeping the disease well under control, so that no serious losses are taking place.

Cagayán and Isabela.—There are several infected municipalities in these two provinces, but apparently very little loss has as yet been sustained. Dr. Ray O. Porter left for Aparri on September 7 with a force of live-stock inspectors to take charge of the outbreak in this district.

Cebu.—In the Island of Cebu there are eight infected municipalities, but the number of cases that have been discovered is surprisingly few. Losses that have been caused by the deaths of animals are so small as to pass almost unnoticed by the people in this section.

La Laguna.—Rinderpest has been eradicated from the municipalities of Pangil, Mabitac, and Siniloan, but during the beginning of this month the disease was again discovered in Santa Maria after that municipality was supposed to have been clean for several days. Infection has also recently been discovered at Santa Cruz.

Leyte.—Rinderpest has existed in the municipality of Tanauan during the past month, but there have been no cases for so long a time that this town is now considered practically free from disease.

Nueva Vizcaya.—The rinderpest infection has now been eradicated, the province being considered free from this disease on August 24, 1911.

Oriental Negros.—The municipality of Tanjay on the mainland of Oriental Negros is infected. A month ago there were several infected towns on the Island of Siquijor. A large force of veterinarians and live-stock inspectors, assisted by Scout troops, have made every possible effort to free the island from disease, and recent reports indicate that the task has practically been accomplished.

Pampanga.—In this province there are four infected municipalities, Minalin, Santa Rita, Mexico, and Florida Blanca.

Pangasinan.—The results that have been accomplished by the efforts to eradicate rinderpest in this province have been remarkable. It may well be said that success is due largely, if not wholly, to the great assistance rendered by the military authorities. Ten companies of Philippine Scouts have successfully maintained the quarantine that the large force of veterinarians and inspectors have found necessary. The campaign which was started in the eastern part of the province several months ago has proceeded gradually westward as the territory was cleaned, and now the force is occupying the most western towns with the expectation that within a few weeks the whole province may be declared free from rinderpest.

Rizal.—The municipalities of Antipolo, Pililla, and Tanay are still considered to be infected, but in none of these has a case of rinderpest been found for several days.

Tarlac.—The municipalities of Camiling, Concepción, and Tarlac are infected, a few cases being found in each town.

Zambales.—The municipalities of Castillejos, San Antonio, San Felipe, San Marcelino, San Narciso, and Subig, are infected. In all of these, except the last mentioned, the infection has existed for several weeks, and the force at work in that district has, it seems, practically accomplished the eradication of the disease in San Antonio, San Felipe, and San Narciso.

MONTHLY CROP CONDITIONS—JUNE AND JULY.

ABACA.

Albay.—Owing to a rise in price of this product in June, reaching 25 centavos a kilo for the better grades, a considerable amount was harvested and placed on the market. In July, owing to a drop in the price and on account of the rains, very little was harvested. Condition of the growing hemp is fair.

Ambos Camarines.—During the months of June and July 250 hectares were planted, and 82,000 kilos harvested from 1,000 hectares. A kilo is sold at 15 centavos.

Batangas.—Some cultivation in the towns of San Jose, Lipa, Santo Tomas, Tanauan, and San Juan; though, on account of low prices and lack of labor, there is very little production.

Bohol.—Less than 400 hectares planted in the Island, mainly for experimental purposes. Usual price per kilo 16 centavos.

Capiz.—Some damage in the municipalities of Libucan, New Washington, Malinao, and Cajidiocan, due to the recent storm, the loss being 25 per cent of the crop. Present prices from 17 to 23 centavos a kilo.

Cavite.—Some damage to the growing crop during the last storm. Present price is ₱20 for No. 1, and ₱18 for No. 2.

Cebu.—Approximately 100 hectares planted during the two months, during which time there was a production of about 70,000 kilos, the price ranging from 11 to 20 centavos per kilo. General condition of the plantations good.

Iloilo.—Very little harvesting going on on account of the continuous rainfall. Superior No. 1 is quoted at ₱20, and current at ₱10 per 63 kilos.

La Laguna.—In the towns of Paete, Longos and Lumbang, 1,000 piculs have been harvested, at ₱8 per 63 kilos.

Leyte.—No increase in the area planted. Some owners are clearing the land and putting in other crops. Outlook poor in this industry due to the present low prices, which ranged from ₱7 to ₱12.25 per 63 kilos.

Mindoro.—No damage was suffered in this section from the recent storm. Present price 18 centavos per kilo. Condition of plantations very good.

Occidental Negros.—One of the products of less importance in this province. Condition of the crop is fair, though considerable damage was done to the plantations during the last storm.

Oriental Negros.—Considerable effort is being made by the growers of this fiber to improve the quality of that produced by hand. The present price is 11 centavos per kilo.

Samar.—This crop is grown to a very considerable extent throughout the province, but owing to the fall in price there has been a great decrease in production as the returns do not compensate the work and expense, in spite of the good quality of fiber produced in this province.

Surigao.—Since the fall in price of abacá no new planting has been done; many plantations have been abandoned by owners who can support themselves in other ways. Good quality varies from ₱11 to ₱12 per 63 kilos.

COCONUTS.

Albay.—The loss caused by the recent typhoon is estimated at 25 per cent of the crop. Fourteen centavos per kilo is paid for copra. One thousand nuts are quoted at ₱25. Forty centavos a liter is paid for the oil.

Ambos Camarines.—23,200 trees were planted in Bato, and about 15,000 nuts were gathered in Milaor. The price per 100 kilos of copra is ₱13.50, ₱2.50 for 100 nuts and 13 centavos a liter of oil.

Bataan.—Cultivated to only small extent in this province, especially in the municipalities of Mariveles, Pilar and Morong. Fresh nuts are sold at 10 centavos each, and, if dried, at 5 centavos.

Batangas.—Cultivated only in the towns of Lipa, San Juan, Santo Tomas, and Tanauan. Considerable damage was suffered from the insects known locally as *wang*. The greater part of the nuts used in this province come from the neighboring provinces of Mindoro and Tayabas. The present price for 100 is ₱4.50.

Bohol.—No damage to this section from the recent storms. Condition of growing crop very satisfactory. The copra is sold from 14 to 16 centavos per kilo.

Bulacan.—Grown on small scale for local consumption. Some damage was suffered from the insects called *wang*. The price paid per nut is 6 centavos.

Capiz.—Present price of copra is 12 centavos a kilo; of the nuts, 4 centavos each. Tuba is sold at 12 centavos per liter. General condition of this crop fair.

Cavite.—Considerable damage during the last storm. No copra was produced during the month of July and the nuts were sold at ₱2 per 100.

Cebu.—Over 3,000,000 kilos of copra produced during June and July, the price ranging from 8 to 15 centavos a kilo; the nuts are sold at 4 centavos each. The price for tuba is 3 centavos for each deciliter. Condition of plantations is excellent.

Ilocos Norte.—Owing to the ravages of the coconut beetle very little is planted in this province, supplies of nuts coming from other provinces. Each nut is worth at present from 15 to 20 centavos.

Ilocos Sur.—The beetle commonly known in Ilocos as *Barrairong* has done much damage to the coconut trees by boring the buds. The nuts are sold in the local market at ₱40 per thousand.

Iloilo.—No damage to the growing crop from insects or storm. Present price of copra is ₱11 per 63 kilos. General condition is satisfactory.

La Laguna.—Some 50,000 coconuts have been planted. Price of copra is ₱9 a picul, and from ₱25 to ₱30 per 1000 is paid for the nuts; the oil is sold at from ₱14 to ₱17.50 per jar containing 48 liters.

La Union.—At present there is no production of copra on account of the recent typhoons. Current price is 5 centavos for each nut.

Leyte.—Considerable increase in the number of new plantings. Harvest good. Copra sells at from ₱8 to ₱9.50 a picul, the nuts from ₱20 to ₱24 per thousand, and the oil at ₱9 per jar of 8 gantas.

Mindoro.—Condition of growing crop good. 12 centavos per kilo is paid for copra. Tuba is sold at 4 centavos per liter.

Occidental Negros.—Some slight damage from the recent storm. That produced locally is sent direct to Iloilo for sale.

Oriental Negros.—Coconut trees did not suffer damage notwithstanding the recent strong winds. The price paid for copra is ₱9.50 per 63 kilos. The nuts are sold at 3 centavos each, and the tuba at 3 centavos per liter.

Palawan.—Coconuts are being planted in Palawan and Coron. Copra brings ₱8 per 63 kilos sun dried. Trees are in good condition.

Pangasinan.—Local price of the nuts is from ₱3 to ₱4 per 100 according to the size of same.

Samar.—Very little harvesting on the east and south coasts of this province, due to the storms of 1908, 1909, and 1910. The price per kilo of copra in June was from ₱8 to ₱8.50. The nuts

sold locally at ₱2 per 100. In many towns in the province tuba is produced which is sold at 20 centavos per 5 liters.

Sorsogon.—Owing to insects and the recent storms there has been very little production resulting in rather high prices. Copra sells at 14 centavos per kilo, and the nuts at 4 centavos each. The price of oil is 40 centavos a liter, and the tuba 3 centavos per liter.

Surigao.—Coconut planting continues in almost all the municipalities of this province, and it is expected that in the near future coconut raising will be the most important industry in this section. The price of white copra ranges from ₱10 to ₱10.25, and for current from ₱9 to ₱10.

CORN.

Albay.—Very little planting on account of the beginning of the rainy season. One hundred ears are sold for ₱1. Consumed locally for domestic use and for feeding poultry. No shelled corn seen in the market. The harvest has been good and the condition of the growing crop is very satisfactory.

Bataan.—In excellent condition before the storm, during which considerable damage was done. In the ear, the price is from 40 centavos to ₱1 per 100. The shelled corn sells at 2 centavos a liter.

Batangas.—This is the season for harvesting this crop, but due to insects and worms (*dupulax*), and the strong winds, there is not even a fair amount produced. The price per cavan of shelled corn, equivalent to 75 liters, is ₱3.50.

Bulacan.—Suffered considerable damage from the recent storm and ensuing flood. Shelled corn at ₱3.50 for 75 liters; in the ear at 1 centavo per ear.

Cagayan.—Condition poor due to the long and steady drought in the months of May and June, since when the floods have caused still further damage.

Capiz.—Considerable damage caused by the storm, the loss being estimated at half of the mature crop, especially in the town of Cajidiocan. In the provincial capital the ears are sold at 50 centavos per 100. The general condition is fair.

Cebu.—A large amount of planting has been done during the last two months. The price per kilo ranges from 5 centavos to 10 centavos per liter of shelled corn. Condition of plantations in general good.

Ilocos Norte.—A large area was planted, but on account of the severe drought and the following typhoon the results were very unsatisfactory. In the provincial capital ₱2 is paid for every 46 kilos on the cob. Shelled corn brings ₱6 for 46 liters.

Iloilo.—Harvesting is now going on, though there is no corn for sale in the market. General condition is poor due to bad weather.

La Laguna.—The plantations were damaged by the two storms which occurred during the month. Those near the coast of the lake have been inundated, and those in high open places have suffered from heavy rains and strong winds. It is estimated that the loss is about 25 per cent of the crop. The price paid per 1,000 ears, according to the quality, ranges from ₱5 to ₱10.

Leyte.—Large plantings of this product are being harvested in this province. No damage suffered from recent storms.

Nueva Ecija.—An estimated loss of 75 per cent of the crop is reported, due to the storms and floods. Present price 75 centavos per 100 ears.

Surigao.—Continuous planting and harvesting is going on. The production bids fair to be the largest ever seen in this province. Seventy-five liters of shelled corn bring ₱3.75.

RICE.

Ambos Camarines.—Three thousand five hundred hectares planted to this crop in June and July. ₱6.70 per cavan is paid for clean rice and ₱3 for palay.

Bataan.—Some damage from lack of rain, and worms. Present price of palay in the capital of the province is ₱3 per 75 liters.

Batangas.—Lowland plantings were completely destroyed by the recent floods. Considerable damage to the seed beds. In high places where transplanting has been done the condition is much better. The price for clean rice is ₱9.33 centavos per 100 liters, and for unhulled rice ₱4.40 per 100 liters.

Bulacan.—In the lowland the condition of the palay is very poor owing to the recent floods; on higher grounds the general aspect is much better.

Cagayan.—Clean rice is sold at the rate of ₱10 per cavan for first class, ₱8 for second, and ₱7.50 for third. These high prices are due to the floods which lasted from the 14th to the 16th.

Capiz.—Some damage to the palay fields in the towns of New Washington, Malinao, and Cajidiocan, especially in Libacao. The general condition promises a good harvest.

Cavite.—In many sections the crop has resulted in an entire loss owing to the heavy and constant rains.

Cebu.—More than 3,000 hectares planted during the two months. The general condition of the plantations is good.

Ilocos Norte.—Very few sprouts survived the recent drought

making it necessary in many cases to prepare new seed beds. There is an estimated loss of one-fifth of the regular crop.

Iloilo.—Early and regular rains have been falling making the prospect for the coming crop excellent.

La Laguna.—The dry season crop has been harvested and lands are now being worked for the wet season crop. No damage from storms.

La Union.—Some slight damage was suffered on account of the recent typhoon.

Mindoro.—On lands irrigated by rainfall the seeds are sown during May, transplanted thirty days later, and harvested at the end of one hundred and twenty days. In high dry lands and *caingins* the seeds are sown on the spot during May and harvested one hundred days later. General condition good.

Palawan.—Mountain or dry rice planting finished this month. Weather condition for same is good. Palay is worth ₱3.50 per cavan. Manila rice sells at ₱7.50. More rice planted this year than last. Condition good.

Pangasinan.—During the early part of July clean rice sold at from ₱6.75 to ₱7 per 75 liters. Owing to the storms and floods during the later half of the month the price reached ₱10 per 75 liters.

Samar.—On the north coast the crop has been satisfactory, while on the east and south it has been poor on account of insects and floods which have caused great damage.

Tarlac.—Some loss in the seed beds on account of the inundation of the Tarlac River. The condition of the growing palay is fair.

SUGAR CANE.

Albay.—Very little planting and harvesting is going on in this province. A panocha of approximately 250 grams sells for 25 centavos.

Bataan.—General condition of the fields is excellent although in some plantations slight damage has been done by the strong winds.

Batangas.—This crop is generally grown in the sea coast towns of this province. Nearly all the plantations are in excellent condition, though some have suffered serious damage from the storms. The price of 63 kilos of sugar is ₱6.

Bulacan.—Considerable damage on account of the recent typhoon and the great number of rats that appeared in this section. Present price of sugar is ₱6 for 63 kilos.

Capiz.—No damage to this crop was reported during the month. The price paid for sugar is 17 centavos a liter.

Cebu.—21,949 hectares of land have been planted to this crop. The price per kilo varies from 10 to 11 centavos. General condition of plantations is excellent.

Ilocos Norte.—The fields suffered considerable damage from the recent drought but the following plentiful rains assure a good crop.

Iloilo.—Late planting in the highlands is about to end. The weather conditions are not favorable for late crops. Owing to early rainfall the general condition is not satisfactory. In many places the lowland plantings were lost.

La Laguna.—The sugar cane plantations are in excellent condition, and promise a good and abundant harvest. Estimated to be about 50 per cent over that of last year. Sugar is quoted at from ₱4 to ₱7 according to grade.

La Union.—In spite of some slight damage during the last baguio it is very probable that there will be a good crop. Sugar in panochas is sold at 6 centavos per liter.

Nueva Ecija.—Up to the present time no damage to the crop has been reported. Present price ₱7 per 63 kilos.

Occidental Negros.—The continuous rains have retarded the growth and development of the cane. As a result, there is an estimated decrease in the production. Sold at ₱6.50 per 63 kilos, assorted.

TOBACCO.

Batangas.—Grown in the town of San Jose, to a considerable extent. The price in the provincial capital is ₱9 for 46 kilos.

Cagayan.—Good quality harvested. Commercial operations have begun slowly. The price is still unsettled, present quotations being ₱4.75 per bale.

Cebu.—Some 373,000 kilos have been harvested, the price ranging from 12 to 80 centavos per kilo according to the quality of the tobacco. General condition of the plantations is fair.

Ilocos Norte.—The general aspect of the crop is better than that of previous years. The price in the provincial capital is ₱5 for 46 kilos.

Ilocos Sur.—The production of tobacco during the last month is estimated at 60,000 pounds.

La Union.—Some loss of tobacco in deposit on account of recent floods, especially in Naguilian. Present price from ₱7 to ₱7.50 per quintal.

Mountain Province.—Quantity grown of very fine quality and compares favorably with the best Isabela leaf. Sold in small quantities in Cagayan and Abra.

CURRENT NOTES.

SENSITIVE PLANT.

The Chamber of Agriculture of New Caledonia is offering sensitive plant seeds (*Mimosa pudica*) to the agriculturists of that Island. Judging by the price (50 centavos per kilo) and the directions for insuring rapid germination of the seeds, it would seem that the matter is being taken up quite seriously by the said chamber. This is somewhat remarkable in face of the fact that in many, if not all, tropical countries this plant has become a weed and in some instances a serious pest, killing out the natural grasses and intertwining its spiny stems among the forage and thereby rendering it practically worthless. One good report of it in the Philippines has reached this Office, but the statement that this plant was much relished by cattle leads one to suspect that there must be considerable variation of individual preference among animals in regard to this plant—or else that some semi-spineless form has originated here.

DESTRUCTION OF LANTANA.

The Chamber of Commerce of New Caledonia has just sent an expert to Hawaii to collect and take back a quantity of the flies which have been found to greatly assist in keeping that terrible weed in check there.

This shrub which caused so much damage in Hawaii a few years ago is now generally scattered throughout the Philippines and is spreading, not rapidly perhaps, but surely, unless more active measures are taken to eradicate it. So far as we know the only efforts made to destroy this plant on a large scale have been made at and near La Carlota experiment station, Occidental Negros.

BLIGHT-RESISTANT COFFEES.

Since the advent of the coffee blight (*Hemileia vastatrix*) into the Philippines some twenty-five or thirty years ago, it has been practically impossible to raise even a fair crop of coffee below 2,000 feet elevation. This blight destroyed the coffee industry not only in the Philippines but in Java, Ceylon, and the Malay Peninsula at about the same time that it reached this Archipelago.

An attempt is being made now by several of the old coffee countries to discover or create one or more varieties of coffee which will be resistant to this fungus, and it is believed there is some hope in some of the new hybrids of robusta coffee (*Coffea robusta*). This Bureau now has growing at the Lamao experiment station a considerable quantity of this coffee, and a little later seed will be distributed to any one who wishes to experiment with the variety. However, like several of the noncommercial coffees this robusta does not have a first-class flavor, though it is in some respects better than that of either Liberian (*C. liberica*) or the Inhambane coffee of Mozambique. Another trouble with the new coffees is that they are for the most part very weak in caffeine, the active principal of the beverage—some of them possessing no stimulating qualities whatever.

COPRA TRADE IN THE PHILIPPINES.

The Philippine Islands shipped abroad 116,374 metric tons of copra in the calendar year 1910, and the average price for the year was about 3½ cents gold per pound. The price increased during the year from about 3 cents to about 4 cents gold per pound in the last quarter.

The steady growth of the trade is indicated by the fact that shipments increased from 168,473,499 pounds, valued at \$5,461,680, in 1908, to 232,728,116 pounds, valued at \$6,657,740, in 1909, and to 254,156,982 pounds, valued at \$9,153,951, in 1910 (fiscal years in each case), and that there was an increase from 113,463 metric tons in the fiscal year to 116,374 metric tons in the calendar year of 1910.

Because of the high price, due chiefly to the extraordinary demand for vegetable oils, and because of the strong demand generally, there is something of a boom in the coconut business in the Islands, and the increase in trade is having a marked effect, not only on the Islands themselves, but upon shipping in the Far East and other lines of business.

Importance of the crop.—In the Philippines the export of copra is now the second largest element in the foreign trade, comprising almost a fourth (23 per cent) of the whole and being exceeded only by hemp. Coconut planting is being carried on more extensively than ever before. Six years ago there was a period of high prices, during which time extensive plantings were made, and these trees will come into production this year. Indications are that the export of the product during 1911 will exceed all previous years in volume, while, owing to the

shortage of other oil-producing crops, the prevailing high prices may continue for some time.

Naturally, such conditions are leading to a general expansion of business in all lines connected with coconut planting and plantation supplies.

Growth of trade with the United States.—Exports of copra from the Philippines to the United States have more than kept pace with the increased imports into the latter country due to the demand for coconut oil. The total imports of copra into the United States during the fiscal years 1908, 1909, and 1910 were \$481,232, \$666,820, and \$762,560, respectively, and the imports thereof from the Philippines were \$213,999, \$273,497, and \$416,074, respectively.

The increase in imports of copra into the United States during the three years was about 58 per cent, while the increase in imports from the Philippines was about 90 per cent. Nevertheless, most of the product went to France, mostly to Marseille, where the great coconut-oil factories are largely dependent upon the Philippines for their copra supplies. France took \$6,114,324 worth of the product in the last fiscal year. Germany, particularly Mannheim, takes an increasing quantity, while Spain maintains a trade long established. (Daily Consular and Trade Reports.)

PHILIPPINE HARDWOODS.

The general scarcity of good hardwoods in China has long been noted in the southern portion of the Empire. Recently some of the lumber exporters of the Philippines have come to realize that there seem to be excellent possibilities along these lines, especially in the coast ports. In order to test the market, a shipload of logs has been sent to Shanghai and will there be sawed in such a way as to best appeal to that local market. Owing to the scarcity of labor in the Philippines and its high price, it may be possible to ship the logs to China, have them sawed in China and distributed along the coast at a less total cost than if they were sawed in the Philippine and shipped direct. (Daily Consular and Trade Reports.)

PHILIPPINES AT SAN FRANCISCO.

Philippine business interests are anxious to have an exhibit, costing at least \$250,000, representing the Islands at the Panama-Pacific Exposition at San Francisco and are at work with a view to securing it. (Daily Consular and Trade Reports.)

HEMP EXPORT DUTY.

Practically all growers and dealers in the Philippines interested in the hemp industry agree in the opinion that the removal of all export taxes from the product is necessary for the development and improvement of the industry. The matter has been taken up formally for presentation to the proper authorities in Washington. The present export duty is 75 cents per 100 kilos, or 220.46 pounds, except for direct shipments to the United States, when no export duty is charged.—B. of M. (Daily Consular and Trade Reports.)

ROSELLE.

The roselle (*Hibiscus sabdariffa*) which was introduced and distributed to a limited extent this spring by the Bureau, is making a most satisfactory growth at the experiment stations, and a good yield of fruit and seed for future distribution is expected.

The roselle is an annual related to the cotton and okra, and is probably the only plant in the world whose calyces are utilized for food. The plant flowers in October and the rapidly developing fleshy calyces are picked and used in making sauces, jellies, or jams, very similar in flavor to those made from the cranberry. A good wine is also made from the calyces. A very agreeable cooling drink may be made from the leaves and tender twigs, steeped in boiling water. In India the roselle is grown principally for its fiber.

The many useful qualities of the roselle and the ease with which it may be cultivated are sure to make it a favorite among all classes as soon as it becomes known in the Philippines.

**INTERNATIONAL RICE CONGRESS AND INTERNATIONAL
EXPOSITION OF RICE CULTURE AND
IRRIGATION (TO BE HELD AT
VERCELLI, ITALY).**

At Vercelli, the governmental seat of a rice-producing region par excellence, which has the advantages of vicinage and convenient communication with the other most important Italian rice districts, there is now being organized the International Rice Congress in connection with the Rice Culture and Irrigation Exposition, both of which will be held in October, 1912.

In this congress there will be discussed vital questions of the present day relative to rice culture, that is, technical questions bearing on the subjects of rice, of rural and social economy, and of hygiene and commerce in their intimate and direct relation to rice culture; other similar matters affecting irrigation will also be investigated.

Such particular interest will attach to the international exposition of rice culture and irrigation, that it is proposed to collect in special exhibits all that concerns rice culture and irrigation, in order to give an idea of the progress made therein and the present status of both.

In Italy, where rice culture is of great importance with respect to other countries, where irrigation presents the oldest, the most classic, and at the same time the most perfect examples of such work, and where, nevertheless, in her arid regions there are problems that urgently demand solution, we may justly take the initial steps in the organization of this special exposition of rice culture and irrigation.

In the exposition of rice culture there will be collected specimens of all the material and machinery necessary for the cultivation, harvesting, drying and commercial preparation of rice. There will be exhibits of commercial rice, a special exhibit of select seed rice, an exhibit of rice intended for exportation or for domestic consumption, and of the products derived therefrom. Another feature will be exhibits of fish culture in the rice regions, exhibits concerning hygiene and diseases in their relation to rice

plantations, exhibits of agrarian associations and organizations and offices for the employment of laborers for rice farms, and matters pertaining to the rice industry and to technical instruction in the various branches. There will also be a retrospective exhibit of the rice industry and of rice culture.

In the irrigation exposition, there will be exhibits of the different systems of irrigation, water sources, dams, artesian wells, elevators, water meters, mechanical appliances used in irrigation, monographs on irrigation, irrigation firms, companies and partnerships, etc.

As soon as possible the program pertaining to this subject will be published.

BOOK REVIEW.

By O. W. BARRETT,

Chief of the Division of Experiment Stations.

Notes on the Soil and Plant Sanitation of Cacao and Rubber Estates, by Harold Hamel Smith, (John Bale, Sons & Danielsson, Ltd. price 10 shillings, net). This book appears to meet a long-felt want of the tropical planter, not only in rubber and cacao lines, but in all branches of tropical agriculture which are based upon plant and soil ecology and biology. The book is published in London by the Tropical Life Publishing Department (John Bale, Sons & Danielsson, Ltd.), the author himself being the editor of the very popular planter's journal, *Tropical Life*.

The book contains chapters on the principal subjects of vital interest to the tropical planter, such as stump pulling, protective belts, green manuring, preparation of plant foods from waste products, fungi pests, etc. There are also up-to-date ideas on cacao grafting, rubber diseases, etc., and the latest mechanical appliances from plows to cacao polishers and rubber-smoking machinery are fully discussed.

Instead of the author giving his own views, which are, however, well worth consideration, the opinions of the world's principal experts in cacao, rubber, and tropical estate management are given, either verbatim or condensed, on their respective specialties.

The book is thoroughly modern in every feature, and while perhaps somewhat too "specialized" for the average estate superintendent, no estate proprietor in the tropics can afford to be without this handbook of modern estate sanitation.

MARKET REPORTS.

Notes on Manila markets for July.

By KER & Co.

(Based on advices from New York, June 16; San Francisco, June 21; London, June 29;
Hongkong, July 25. Iloilo, July 25; Cebu, July 29.)

SUGAR.

Iloilo.—Prices in the interval have advanced smartly on advices from New York; we quote ₱8.75 No. 1, per picul first cost, ₱8.25 No. 2, and ₱7.25 No. 3. There is little, if any, sugar still in first hands and the season is practically finished; shipments after August will be trifling.

HEMP.

Quiet but steady at ₱9.50 United States and ₱9 United Kingdom current per picul first cost f. o. b. Good current quoted ₱16 per picul first cost. About 10,000 bales have been burnt in fire at Cebu. Receipts at all ports for the seven months were 748,809 bales against 801,487 bales in 1910 and 731,734 bales in 1909, for the corresponding period.

COPRA.

Steady at ₱11.50 per picul Cebu fair merchantable sun dried and ₱10.75 Manila fair merchantable, first cost f. o. b.

DISTRIBUTION OF PRINCIPAL PHILIPPINE EXPORTS FOR THE SEVEN MONTHS (JANUARY TO JULY, 1911).

Products exported.	United States.	China.	Pacific coast.	Great Britain.	Continent of Europe.	Australia.	Japan.	Singapore.
Dry sugar (tons) -----	82,709	14,776	12,625	2,500				
Hemp (bales) -----	262,314	6,450		807,669	68,176	14,188	14,909	6,415
Copra (piculs) -----	16,400		106,400	35,200	680,178		1,517	
Cigars (thousands) -----	6,721	19,020		6,672	6,357	5,507	589	8,215

RECEIPTS AND SHIPMENTS OF MANILA HEMP.

(Telegram from Manila to London, August 7, 1911.)

	1911	1910
Hemp receipts at:	<i>Bales</i>	<i>Bales</i>
Manila, since January 1	607,226	633,035
Cebu, etc., since January 1	171,503	193,201
All ports since January 1	778,729	826,236
Shipments by steamer to:		
United Kingdom, cleared since January 1	310,914	293,173
Atlantic coast, United States, cleared since January 1	220,284	315,699
Pacific coast, United States, cleared since January 1	99,870	61,093
Continental ports, cleared since January 1	63,179	36,626
Shipments to:		
All other ports	52,841	
Local consumption since January 1	7,000	
	59,841	44,375
Loading steamer on the berth for:		
United Kingdom, about		1,300
Atlantic coast, United States, about	26,000	5,200
Shipments per sailer to Atlantic coast, United States, since January 1		20,660

Bales of hemp loading for United States, by steamer

St. Ranaid	2,000
Shimosa	11,000
Kabinga (Cebu)	13,000

LONDON FIBER MARKET.

The following prices for Manila hemp, sisal, and maguey were quoted by Messrs. Landauer & Co., London, on July 5, 1911.¹

Manila hemp.—The market for fine marks has likewise been a steadily rising one. Values good current £34, fine marks £40 to £44, according to quality, even £45 has been refused for one of the finest marks. Spot hemp has benefited from the firmer tendency for forward shipment. Early in the week a few insignificant sales were effected on the basis of £19 5/- to £19 10/- for fair current, but at the close, there are further buyers without sellers except at an advance. Closing values nominally fair current £19 15/-, and good brown £18 15/-.

Range of prices.

Grades	Spot and close by		
	Per ton	Per ton.	Per picul.
Best marks	40/- - 43/-	£400.00 - £430.00	£25.00 - £26.90
Good marks	38/- - 40/-	380.00 - 400.00	23.75 - 25.00
Good current	33/- - 34/-	330.00 - 340.00	20.63 - 21.25
25 per cent over current	22/- - 22/6	220.00 - 223.00	13.75 - 13.95
Fair current	19/9 - 20/-	191.50 - 200.00	12.16 - 12.50
Superior seconds	19/3 - 19/6	191.50 - 193.00	11.97 - 12.10
Good seconds	19/- - 19/3	190.00 - 191.50	11.85 - 11.97
Fair seconds	18/9 - 19/-	181.50 - 190.00	11.55 - 11.85
Good brown	18/6 - 18/9	183.00 - 184.50	11.45 - 11.55
Fair brown	18/- - 18/6	180.00 - 183.00	11.25 - 11.45

¹ These quotations are in pounds and shillings English currency per ton. One pound equals about 10 pesos Philippine currency. One ton equals approximately 16 piculs.

Sisal hemp.—No change in the New York market, which remains nominally at 4½ cents charges including freight Europe for fair average quality. It is to be noted that while stocks of this article only three to four months ago exceeded 120,000 bales, they have now been considerably reduced, and to-day probably do not exceed 30,000 bales. Even this quantity is probably in course of transshipment, as we hear from our friends in Yucatan that the stocks in the hands of planters have been entirely exhausted.

Manila maguey.—During the past two or three months a large business has taken place in this commodity. This is not surprising in view of the relatively low figures ruling as compared with prices for all other white fibers. We consider the article deserves more than usual attention. We quote No. 1 Cebu at £19, No. 1 ordinary at £16, No. 2 at £15 and No. 3 at £13 10/—.

The Manila quotations for the same date were ₱7 for No. 1.

ILOILO SUGAR MARKET.

Sugar was received from the mills and sugar districts amounting to 396,295 piculs for May and 238,405 for June. The price of 6 pesos and 2½ reales¹ at the beginning of May dropped on the 2d to 6 pesos and one-half real; this continued until the 18th when it went down to 5 pesos and 6½ reales, since when there was a gradual decline to 5 pesos and 4½ reales. During June there was but a slight increase, and that was on the 7th when 5 pesos and 5½ reales were paid until the 12th; on this date 5 pesos and 4½ reales was again quoted, which price remained steady until the close of the month.

MAY SHIPMENTS.

[In piculs.]

Date	Vessel	Destination	superior	Wet
May 3	Strathgyle	U. S. of America	89,600	—
May 13	Strathgyle	do	91,200	—
May 17	Kygn	San Francisco	20,000	—
May 22	Indramayo	U. S. of America	96,000	—
Total for May			296,800	—

¹ One real equals 12½ centavos.

JUNE SHIPMENTS.

[In piculs.]

Date	Vessel.	Destination	Superior.	Wet.
June 3	Tean	Hongkong via Manila	2,600	
June 9	Indrawadi	U. S. of America	68,000	
June 24	Tean	Hongkong via Manila	1,494	
June 25	Bisley	U. S. of America	80,000	
Total for June			152,094	

EXPORTS UP TO JUNE 26, 1911.

[In piculs.]

To—	1909-10 crop.		1910-11 crop.	
	Superior.	Wet	Superior.	Wet.
United States	588,000		830,800	
China	64,575	29.38	140,066	426
Total	652,575	29.38	970,866	426

PRINCIPAL PHILIPPINE IMPORTS AND EXPORTS— MAY, JUNE, AND JULY.

By the INSULAR COLLECTOR OF CUSTOMS.

[Values in dollars, United States currency]

MAY.

IMPORTS.

Articles.		Manila	Cebu	Iloilo	Totals
Rice	(Kilos.....	6,985,253	4,203,629	1,286,666	12,475,548
	(Value.....	219,208	152,305	16,969	418,482
Beef cattle	(Numbers.....	2,849			2,849
	(Value.....	66,207			66,207
Eggs	(Dozens.....	442,033	63	347	442,443
	(Value.....	31,707	7	36	31,750
Sugar	(Kilos.....	198,624	17,430	26,596	242,656
	(Value.....	15,975	1,221	1,855	19,121
Coffee	(Kilos.....	46,365	1,293	31	47,689
	(Value.....	15,827	253	11	16,093
Cacao	(Kilos.....	60,015	20,561		80,576
	(Value.....	16,842	5,566		22,408
Raw cotton	(Kilos.....	57,478			57,478
	(Value.....	20,243			20,243

EXPORTS.

Hemp.....	(Kilos.....	11,686,773	2,043,700		13,730,473
	(Value.....	1,098,247	209,089		1,307,336
Copra.....	(Kilos.....	4,847,607	99,800	201,639	5,149,046
	(Value.....	390,148	8,200	16,450	414,798
Sugar.....	(Kilos.....	12,647,040	1,013,256	14,319,375	27,979,681
	(Value.....	602,084	54,000	769,493	1,425,577
Cigars.....	(Thousand.....	9,013			9,013
	(Value.....	134,289			134,289
Cigarettes.....	(Thousand.....	3,147			3,147
	(Value.....	3,244			3,244
Tobacco.....	(Kilos.....	1,287,333			1,287,333
	(Value.....	195,751			195,751

JUNE.

[Values in dollars, United States currency]

IMPORTS.

Articles.		Manila	Cebu	Iloilo.	Totals
Rice	Kilos	3,398,752	3,985,237	3,297,020	10,681,009
	Value	121,486	139,809	112,874	374,169
Beef cattle	Numbers	1,727	198	800	2,225
	Value	42,913	4,739	7,492	55,144
Eggs	Dozens	409,635	82	209	409,926
	Value	26,998	8	21	27,027
Sugar	Kilos	143,875	20,027	37,462	201,364
	Value	9,709	1,584	2,407	13,713
Coffee	Kilos	76,388	2,112	410	78,910
	Value	19,298	622	223	20,143
Cacao	Kilos	81,955	6,157	44	88,156
	Value	19,561	1,712	13	21,286
Raw cotton	Kilos	11,548			11,548
	Value	4,133			4,133

EXPORTS.

Hemp	Kilos	13,138,861	1,187,100		17,325,961
	Value	1,155,146	400,755		1,555,901
Copra	Kilos	3,843,272	1,772,056	372,442	5,987,770
	Value	327,639	154,920	30,360	512,919
Sugar	Kilos	13,384,178		9,704,901	23,089,079
	Value	668,362		496,839	1,165,201
Cigars	Thousand	10,087			10,087
	Value	139,973			139,973
Cigarettes	Thousand	3,087			3,087
	Value	3,333			3,333
Tobacco	Kilos	790,477			790,477
	Value	130,614			130,614

JULY.

[Values in dollars, United States currency]

IMPORTS.

Articles		Manila	Cebu.	Iloilo	Totals
Rice	Kilos	12,351,803	3,918,655	3,098,249	19,368,707
	Value	419,009	110,354	98,628	627,991
Beef cattle	Numbers	2,465		3	2,468
	Value	60,144		250	60,394
Eggs	Dozens	447,542	28	363	447,933
	Value	30,440	2	40	30,482
Sugar	Kilos	276,514	3,482	14,481	294,477
	Value	19,262	307	977	20,546
Coffee	Kilos	103,180	2,351		105,531
	Value	27,976	686		28,662
Cacao	Kilos	46,347	5,036	582	51,965
	Value	12,136	1,385	175	13,696
Raw cotton	Kilos				
	Value				

EXPORTS.

Hemp	Kilos	2,491,646	2,642,712		5,134,358
	Value	249,827	274,909		524,736
Copra	Kilos	5,906,065	5,108,341	605,730	11,620,136
	Value	514,000	456,424	52,664	1,023,088
Sugar	Kilos	2,521,640	1,019,664	14,955,941	18,497,245
	Value	118,259	43,000	785,941	947,200
Cigars	Thousand	9,438			9,438
	Value	128,407			128,407
Cigarettes	Thousand	1,197			1,197
	Value	1,423			1,423
Tobacco	Kilos	597,557			597,557
	Value	90,658			90,658

CROPS PLANTED AND HARVESTED AND CONDITION OF SAME TAKEN FROM QUARTERLY CROP REPORTS FOR THE QUARTER ENDING MARCH 31, 1911.

By WM. D. HOBART, *Statistician.*

[NOTE—Attention is invited to the fact that rice should be understood as being in the unhulled state. 75 liters=1 cavan; 63.25 kilos=1 picul, 46 kilos=1 quintal, 11.5 kilos=1 arroba; 0.4047 hectare=1 acre.]

Province and crop	Condition	Planted during quarter	Harvested during quarter		
			Area	Quantity.	Unit
		<i>Hectares</i>	<i>Hectares</i>		
Agusan					
Rice	Good	364	61	36,450	Liters
Abaca	do	875	2,543	255,720	Kilos
Copra	do			17,026	Do
Corn	do	65	50	75,204	Liters
Albay					
Rice	Fair	5,710	22,083	17,839,050	Do
Sugar cane	do	127	103	31,325	Kilos
Abaca	Good	76	22,787	4,827,177	Do
Copra	do			1,257,092	Do
Corn	do	140	156	108,100	Liters
Ambos Camarines					
Rice	Fair	9,211	17,645	19,213,206	Do
Sugar cane	do	233	198	156,796	Kilos
Abaca	do	80	16,542	2,002,748	Do
Copra	do			187,847	Do
Corn	do	128	86	9,550	Liters
Antique					
Rice	do	4	100	75,000	Do
Sugar cane	Good	5,123	1,579	3,325,823	Kilos
Abaca	Fair	51	73	16,382	Do
Copra	do			800,113	Do
Corn	do	137	154	41,700	Liters
Bataan					
Rice	Good	359	3,722	8,863,135	Do
Sugar cane	do	255	211	254,644	Kilos
Corn	Fair	9	9	2,250	Liters
Batangas					
Rice	do	448	945	965,460	Do
Sugar cane	Good	7,609	4,801	8,753,419	Kilos
Abaca	Fair		375	60,783	Do
Copra	do			9,187	Do
Corn	do	505	1,601	541,875	Liters
Bohol					
Rice	do	9,790	10,318	4,775,625	Do
Sugar cane	do	177	671	448,993	Kilos
Abaca	do	1,008	603	131,659	Do
Copra	do			3,897,971	Do
Corn	do	1,863	1,491	566,775	Liters
Bulacan					
Rice	do	7,136	25,652	28,287,525	Do
Sugar cane	do	2,660	3,397	5,146,804	Kilos
Tobacco	do	18	281	107,870	Do
Corn	do	173	1,150	407,925	Liters
Cagayan					
Rice	do	5,559	9,816	10,080,300	Do
Sugar cane	do	49	106	94,875	Kilos
Tobacco	do	9,604	3,222	2,106,662	Do
Corn	do	2,995	3,008	2,659,125	Liters
Capiz					
Rice	Poor	829	304	10,932	Do
Sugar cane	Fair	1,328	521	699,039	Kilos
Tobacco	do	405	110	21,656	Do
Abaca	do	280	1,037	415,110	Do
Copra	do			335,121	Do
Corn	Good	1,373	353	429,450	Liters

Crops planted and harvested, etc.—Continued.

Province and crop.	Condition.	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
		Hectares.	Hectares.		
Cavite:					
Rice	Fair	2,972	7,952	9,580,200	Liters.
Sugar cane	do	1,537	1,741	2,867,838	Kilos.
Abaca	do		600	116,000	Do.
Copra	do			63,250	Do.
Corn	do	205	150	26,325	Liters.
Cebu:					
Rice	do	518	952	1,209,800	Do.
Sugar cane	do	3,536	2,222	421,568	Kilos.
Tobacco	do	4,993	995	398,740	Do.
Abaca	do	89	1,533	940,717	Do.
Copra	Good			1,857,652	Do.
Corn	Fair	14,557	31,447	39,075,075	Liters.
Magney	do	69	745	211,950	Kilos.
Ilocos Norte:					
Rice	do	4,808	19,670	85,584,900	Liters
Sugar cane	do	1,918	1,613	1,130,970	Kilos
Tobacco	do	2,259	66	21,896	Do.
Corn	do	618	236	119,700	Liters.
Magney	do	51	67	15,246	Kilos.
Ilocos Sur					
Rice	Good	131	2,831	2,803,275	Liters
Sugar cane	do	3,536	3,210	7,226,845	Kilos.
Tobacco	Fair	401	190	29,348	Do.
Corn	Good	1,368	1,276	735,300	Liters
Magney	Fair	6	1,061	1,217,246	Kilos
Iloilo:					
Rice	do	4,656	20,583	32,444,450	Liters.
Sugar cane	Good	4,676	2,867	6,309,010	Kilos.
Tobacco	Fair	820	96	26,910	Do.
Abaca	Good	202	312	151,547	Do.
Copra	do			96,772	Do.
Corn	Fair	213	161	160,125	Liters.
Isabela					
Rice	do	160	465	323,025	Do.
Tobacco	do	24,187	10,513	5,320,216	Kilos
Corn	do	2,191	1,632	514,650	Liters
La Laguna:					
Rice	do	2,444	5,770	9,113,925	Do.
Sugar cane	Good	863	810	709,340	Kilos.
Abaca	Fair	2	352	247,813	Do.
Copra	do			1,813,124	Do.
Corn	do	12	176	149,100	Liters
La Union:					
Rice	Good		1,844	1,246,650	Do.
Sugar cane	Fair	809	814	1,296,680	Kilos.
Tobacco	do	2,947	2,488	852,380	Do.
Copra	do			7,377	Do.
Corn	do	43	338	147,150	Liters.
Magney	do	1	59	20,479	Kilos
Leyte:					
Rice	do	5,095	4,987	3,186,225	Liters.
Sugar cane	Good	205	222	127,385	Kilos.
Tobacco	Fair	2,645	72	19,442	Do.
Abaca	do	1,514	28,997	7,025,051	Do.
Copra	Good			1,128,064	Do.
Corn	Fair	3,020	3,120	3,952,300	Liters.
Mindoro					
Rice	Good	8	39	30,000	Do.
Abaca	Fair		1,512	834,141	Kilos.
Copra	do			14,421	Do.
Corn	do	38	44	14,175	Liters.
Misamis:					
Rice	do	690	820	463,150	Do.
Abaca	do	7	7,031	1,044,131	Kilos.
Copra	Good			1,000,678	Do.
Corn	Fair	83	71	82,700	Liters.
Moro:					
Rice	do	937	750	1,192,050	Do.
Sugar cane	do	46	40	86,052	Kilos.
Abaca	do	139	2,384	1,055,694	Do.
Copra	Good			1,142,228	Do.
Corn	Fair	61	248	140,175	Liters.
Mountain:					
Rice	Good	2,166	737	1,155,000	Do.
Sugar cane	do	174	190	118,530	Kilos.
Tobacco	do	92	26	8,142	Do.
Corn	do	8	70	51,225	Liters.

Crops planted and harvested, etc.—Continued.

Province and crop.	Condition	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
		<i>Hectares.</i>	<i>Hectares.</i>		
Nueva Ecija:					
Rice	Fair	---	30,695	98,219,850	Liters.
Sugar cane	Good	717	492	532,122	Kilos.
Tobacco	do	61	848	499,560	Do.
Corn	Fair	2	215	98,575	Liters
Nueva Vizcaya:					
Rice	Fair	2,102	4,167	5,885,956	Liters
Sugar cane	do	62	48	31,091	Kilos
Tobacco	do	22	132	77,372	Do
Corn	do	136	119	70,575	Liters
Occidental Negros:					
Rice	Good	---	2,932	3,745,575	Do
Sugar cane	do	25,942	13,549	63,927,106	Kilos
Tobacco	Fair	157	245	130,180	Do.
Abaca	Good	18	816	255,783	Do.
Copra	do	---	---	191,774	Do
Corn	do	334	361	267,750	Liters
Oriental Negros:					
Rice	Fair	356	894	888,000	Do
Sugar cane	do	1,569	561	4,596,958	Kilos.
Tobacco	do	334	222	85,248	Do
Abaca	do	214	501	212,953	Do.
Copra	Good	---	---	518,704	Do.
Corn	Fair	737	4,002	1,518,900	Liters.
Palawan:					
Tobacco	do	10	10	1,794	Kilos.
Copra	Good	---	---	63,946	Do.
Pampanga:					
Rice	Fair	11,987	21,837	41,700,525	Liters
Sugar cane	do	34,495	27,880	47,024,980	Kilos.
Tobacco	do	50	110	74,272	Do.
Corn	do	292	212	316,680	Liters
Pangasinan:					
Rice	do	1,111	21,547	43,954,850	Do.
Sugar cane	do	3,403	3,103	2,408,686	Kilos.
Tobacco	do	5,707	3,751	1,473,982	Do
Copra	do	---	---	251,229	Do.
Corn	do	315	814	697,800	Liters
Maguey	Good	---	294	291,203	Kilos
Rizal:					
Rice	do	1,195	2,113	2,172,075	Liters
Sugar cane	Fair	869	1,645	1,230,402	Kilos
Corn	do	233	64	19,500	Liters.
Samar:					
Rice	do	7,218	1,035	623,975	Do.
Sugar cane	do	344	223	2,875,825	Kilos.
Tobacco	do	395	51	9,384	Do.
Abaca	do	801	5,239	3,231,572	Do.
Copra	do	---	---	715,041	Do.
Corn	do	154	1,602	419,625	Liters.
Sorsogon:					
Rice	Good	4,748	1,626	1,397,825	Do
Sugar cane	do	258	248	57,011	Kilos.
Abaca	do	451	35,408	5,544,072	Do
Copra	Fair	---	---	180,262	Do.
Corn	do	224	175	226,000	Liters.
Surigao:					
Sugar cane	Good	161	25	23,655	Kilos
Abaca	Fair	120	3,810	1,058,596	Do
Copra	Good	---	---	77,861	Do
Corn	do	307	4	1,500	Liters.
Tarlac:					
Rice	Fair	2,102	11,992	7,897,700	Do
Sugar cane	do	63,623	8,912	3,678,051	Kilos
Tobacco	do	86	64	77,786	Do.
Corn	Good	47	40	72,000	Liters
Tayabas:					
Rice	do	15,277	6,298	2,177,175	Do
Sugar cane	Fair	905	1,041	962,095	Kilos
Tobacco	do	93	65	10,948	Do.
Abaca	do	87	453	203,855	Do.
Copra	Good	---	---	2,898,368	Do
Corn	do	169	519	194,150	Liters.
Zambales:					
Rice	do	2,240	5,827	7,656,950	Do.
Sugar cane	Fair	255	---	215,866	Kilos.
Copra	do	---	---	23,276	Do.
Corn	do	51	25	15,675	Liters.

TEMPERATURE AND RAINFALL FOR AGRICULTURAL DISTRICTS IN THE PHILIPPINES— JUNE AND JULY.

By the DIRECTOR OF THE WEATHER BUREAU.

JUNE, 1911.

[Temperature and total rainfall for twenty-four hours beginning at 6 a. m. each day.]

Date	Hemp				Sugar, Iloilo		Rice, Tarlac		Tobacco			
	Albay.		Tacloban						Aparri		San Fernando.	
	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
1	28.7		26.3	16.7	27.5	0.5	27.8		28.5		28.5	
2	27.3	2.3	26.5	6.4	26.5	14.2	28.5		29.1		29.2	
3	28.5	2	27	13.2	26.5	12.5	28.2		29.1		28.4	1.8
4	28.5		26.8	5.8	26.7	3.3	29.6		28.6		28.4	2
5	28.5	4.8	27.2	24.8	27		29.1		28.4		27.8	
6	28	3.3	27.1		27.3		29.3		28.1		28.8	
7	28.3	1.5	27.4		28.4		28.6		28		28.9	
8	28.4		28	2	26.9	6.4	29.6		28.8		29.2	
9	28.2	11.9	28.5		27.7		30.4	1.0	29.2		29.8	
10	28.9	13.5	26.8	4.6	27.7	2.9	30.7		29		27.6	3
11	27.7	4.1	27.7	1.5	27.4	1.1	30.3		28.1	1.3	27.9	6.6
12	28.7	1	27.1	2	27.1	4.9	30.1		28.2		28.4	8
13	27.1	4.5	27.3	32.5	26.7	28.2	30		28.7		29	51.6
14	27.2		27.4		27.6	1.8	27.8	5.1	28.7	22.4	28.3	3
15	28.4		28.4		28.1		28.6	3.5	28.7		28.8	8
16	27.4	13.7	28.1	8.9	27.8	1.6	27.9	6.1	28.8		29.6	29.4
17	27.9		27.6	5.3	27.8	22.4	27.9	13.2	28.3		25.8	52.1
18	26.8	11	27	4.6	27.6	40.4	28	5.1	28.3	3.8	27.3	8
19	26.5		27.3		24.2	47.7	25.7	25.7	26.4	21.6	27.1	17.8
20	27.3		28.2		26	3.3	25.7	3.5	28.1		27.2	4.1
21	28.2		28.1		26.9		26.8		28.1		27.6	5.6
22	28.2		27.1	1	26.9		28.9		28.9		27.6	
23	28.4		27.2	2	26.2	8	29.4		29.3		27.7	
24	27.7		27.2		26.4		30		29		28.2	51.6
25	28.1		27.2	12.2	26.6	22.6	30.6		29		27.8	
26	27.9		26.9		26.4		28.2	8.4	29.2		28.4	
27	27.2	1.1	25.9	13.8	26.1	1.3	27.8	11.1	29.2		28.1	
28	27	5.1	26.8	1.3	26.8		28.2	13	28.2	2.3	28.3	9.1
29	26.6	3.6	26.7	10.2	26.5	1.6	28.8	15.5	27		28.8	38.1
30	25.1	70.9	24.7	14.7	25.2	10.4	28.8	5	28	13.9	26.6	21.6

JULY, 1911.

[Temperature and total rainfall for twenty-four hours beginning at 6 a. m. each day.]

Date.	Hemp.				Sugar. Hollo.		Rice. Tarlac.		Tobacco.			
	Albay.		Tacloban.		Temperature.	Rainfall.	Temperature.	Rainfall.	Aparri.		San Fernando.	
	Temperature.	Rainfall.	Temperature.	Rainfall.					Temperature.	Rainfall.	Temperature.	Rainfall.
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
1	24.3	52.6	25	25	18.1	24.6	27.9	19	27.7	5.4	25.6	32.3
2	27	3.8	25.8	13	25.6	6.9	24.5	50	28.3		25.4	21.3
3	27.9		26.2	1.5	27.5		27.2	.8	28		27.4	
4	28.8		26.6	8.1	27.6	19.8	27.6	48	26.6	44.2	28.2	4.1
5	26.9	2.6	26.4		26	2.5	27.9	2.5	26.7		27	
6	28	.8	27.7		26.9		28.2		27.6		26.4	
7	28.6	.3	27.8	6.3	27.1	4.8	29.4		27.6		28.2	
8	27	1	25.9	16	26.4	8	28.2		28.3		27.9	
9	27.5	26.9	28.1		27.3		29.6	21.6	28		28.2	32.8
10	27.5	17.3	27.8		28.2		29	4.3	27.7		26.9	
11	27.1		28.1	38.1	27.4		28.1		28.4		28.2	
12	25.8	51.8	24.6	68.8	26.5	15.2	29.2		28.2	18	27.8	31.3
13	24.2	129.8	25.4	2.5	25.1	14	28.8	4.1	26.6	37.6	28	
14	26.3	3.1	27.8	17.3	26.5	32.8	24.6	69.1	26.6	36.1		154.5
15	27	3.1	28.2		28.4	12.2	23.8	57.9	24.1	47.2		101.9
16	27.7	1.1	26.7	.8	27.2	24.6	23.8	78.7	23.6	18.9		84.1
17	27.7	1.3	27.8		26.8	33.9	24	111	25.2			78.7
18	27		27.3		26.3	1.3	24	25.6	25.2	19		9.4
19	26.8	.5	27		25.9	.5	25.2	2	26	9.4		
20	27	1.5	27.5		26.6	26.9	27	8.8	26.7			24.9
21	26.9	.8	26.2	11.4	25.9	46.5	24.1	61.5	27.2			.8
22	26.7	2.4	27		27	49.2	24.8	67.8	27.8			17.3
23	26.5	3.3	27.8	3	26.6	133.6	23.7	118.9	27.4	53.1		107.8
24	27	.8	28.1	1.3	25.8	130.9	25	34.8	26.5	1.1		158.6
25	28.1		29.3		27.2	4.8	26.4	7.1	27	16.2		112.8
26	28.2		29		26.8	54.2	27.6	5.6	27.1	.8		37.4
27	28	1.5	28.1	3	26.7	.8	27.9	4.3	27.2	75.4		1.3
28	27.1		25.7	23.1	26.4	.3	27.4		27.1			9.7
29	25.9				25.7	22.3	28.5	57.7	27.8			4.3
30	26.3	2	26.5	.8	26	1	28.5	59.7	28.2	.5		3.6
31	26.4	3.8	26.8	2.5	25.2	49.6	25.6	9.1	26.3	103.7		52.1



PLATE 1—BUDDING AVOCADO IN THE ORCHARD, MIAMI, FLORIDA
(By courtesy of David Fairchild, Bureau of Plant Industry, U S D A)

THE PHILIPPINE *Agricultural Review*

VOL. IV

NOVEMBER, 1911

No. 11

CONTENTS AND ILLUSTRATIONS.

CONTENTS.

	Page.
Editorial	589
Rice Ally Crops, by O. W. Barrett, Chief, Division of Experiment Stations	592
The Propagation of the Avocado, by P. J. Wester, Horticulturist	599
The Tobacco Beetle and a Method for Its Control, by D. B. Mackie, Agricultural Inspector	606
Baling of Fibers, by M. M. Saleeby, Fiber Expert	613
Agriculture along the Philippine Railway, Panay, by W. A. Mace, Agricultural Inspector	616
Current Notes—November: A New Crop for the Philippines; New Plants for the Philippines; Copra Prices; "New Ideas" in Papaya Culture; The Coming Boom in Coconuts; Regulations for Dealing in Copra in Samoa; A New Coconut Pest..	625
Monthly Veterinary Reports—September and October.....	629
Monthly Crop Conditions—August and September	681
Market Reports—September	635
Principal Philippine Imports and Exports for August.....	639
Temperature and Rainfall for Agricultural Districts in the Philippines for August..	640

ILLUSTRATIONS.

PLATE I. Budded Avocado in the Orchard, Miami, Florida.	Frontispiece.
	Facing page—
II. Pot-grown, Budded Avocado	600
III. Shield-budding the Avocado: (a) rejected budstick; (b) ideal budwood; (c) bud inserted before tying, (d) bud	604
IV. Case Used in Fumigation Experiments with the Tobacco Beetle.....	610
V. Cigars Attacked by Tobacco Beetle.....	620

TEXT FIGURE.

FIG. 1. Tobacco Beetle (<i>Lasioderma serricorne</i>). (a) larva; (b) pupa; (c) mature beetle; (d) side view; (e) antenna	612
---	-----

EDITORIAL.

PROVINCIAL FAIRS.

Agricultural fairs are gradually becoming important institutions in all civilized countries. Not only the producers of agricultural products themselves, but the officials of the municipalities and government departments of the countries in which the crops

are grown, realize that anything which will stimulate competition or interest in economic methods will, sooner or later, have a very pronounced effect for the better upon the industry considered in a broad sense. For instance, a farmer may grow a certain variety of corn by a certain method for a number of years, but upon attending an agricultural fair he learns that not only is he growing an inferior variety but that his methods are not so good as those of some of his fellow-planters in a neighboring district; and thus he starts on a new system which puts considerably more cash into his pocket, and the benefit thus gained has been at practically no expense whatever to him.

When we consider that no one with an inquiring mind, who has any interest in agricultural products, can visit an agricultural fair and leave it without having acquired information of value to either himself or his neighbors, we must admit that we can not put out our money in any other similar way to better advantage than by holding agricultural expositions. Furthermore, the fair is usually a good financial investment for the municipality holding it, and premiums, rewards, and special prizes are usually comparatively cheap and effective measures for bringing in from the surrounding country a representative assortment of the best products.

If all the larger towns throughout the provinces could see their way clear to follow the example of Iloilo in the matter of agricultural expositions, we firmly believe the country, as a whole, would reap a splendid benefit.

THE TOBACCO BEETLE.

The tobacco beetle, which has been committing very severe depredations in manufactured tobacco throughout the world, has recently become a very serious menace to the export tobacco trade in the Philippines. Many thousands of pesos have been lost in the last two years due to the fact that this beetle was present in shipments of cigars and cigarettes from Manila. Naturally, the foreign buyers of Philippine cigars refused to pay for material which was infested with this pest and this fact brought the matter straight home to the manufacturers of Manila. For a time it looked as if the export trade would be tremendously reduced, if not practically wiped out, but thanks to modern

methods, the way is now open to the manufacturers and dealers in tobacco to ship absolutely clean goods. The system set forth in the article on the tobacco beetle is not only simple, but the necessary operations to rid the shipments of the pest are quite inexpensive. If the manufacturers would go a step farther and construct beetle-proof warehouses and factories, the insect would soon be practically exterminated and there would be no further need for dealers to worry over what was a short time ago a very grave danger to their business.

RICE ALLY CROPS.

By O. W. BARRETT,

Chief of the Division of Experiment Stations.

There is always grave danger in the one-crop system. No farmer in any country, unless conditions are exceptionally favorable, can afford to risk his future welfare and present prosperity on the basis of a single crop, since naturally that crop is always more or less under the influence of great fluctuations in demand, of severe changes in climate, and of injurious fungus or insect pests. The rice shortage, which at present so seriously affects not only the Philippines but all the countries from Shanghai to Sumatra, serves as an illustration of this principle. In the Philippines, however, this shortage is undoubtedly more severe in its effects upon the poorer classes than in countries like Cochin China, Anam, and eastern China, where ally, or auxiliary, crops greatly relieve the situation. In nearly all the countries of the Far East, with the exception of the Philippines and perhaps the East Indies, soybeans and sorghum enter largely into the daily ration of the people throughout the greater part of the year. Maize is, to some extent, also coming to be a crop of considerable importance, especially in northern China, but in none of the Far Eastern countries is this most potentially valuable of all known cereals used to the extent it deserves. The conservative spirit evidenced toward new foods, not only in the Far East but in all parts of the world, is largely responsible for the lack of interest in maize especially, and to a greater or less extent in several other cereals and legumes.

MAIZE.

When we reflect that outside of the Western Hemisphere and Europe there are comparatively few agricultural peoples who know how to plant corn, and still fewer who know how to prepare it for the table, we can appreciate, in a measure, the deplorable disfavor with which this king of the cereals has been regarded. But times are changing, however, and within a few years it is very likely that maize in its many types will very largely replace

such cereals as rice, wheat, barley, etc., covering, as these types do, a great range in agronomic possibilities—some being adapted to very hot and moist regions and requiring six to eight months to mature, others adapted to cold climates and shallow soils and ripening in sixty, or even fifty, days; moreover some varieties are very rich in starch while others are rich in proteids; some 300 distinct varieties are now under cultivation in the Americas and Europe.

In the Philippines the great fault in regard to maize seems to be that the people using it do not appreciate the fact that it must be cooked at least *twice as long as rice*. Naturally a seed very rich in oily and proteid substances is more difficult to digest than one containing practically nothing but starch. If the Philippine people would realize that corn is really a better food than rice, kilo for kilo, and that the only thing necessary to make it both palatable and nutritious is thorough cooking, they would, I believe, enter upon a new era in the general welfare of the people as well as a new era in the general agriculture of the Archipelago. There are, of course, faults with the present system of cultivation of maize in the Philippines, and again there is chance for great improvement in the varieties now used—which can be brought about either by the introduction of new varieties from abroad, or by the up-breeding of the so-called native sorts, or by both.

A new feature of the case is presenting itself; the leaves of maize may be stripped from the stalks as soon as the seed has begun to harden in the ear, and these leaves when baled form a valuable forage, which will find a ready market at the military posts where horses or mules are stationed. An American farmer in Nueva Ecija finds that *in his experience here this fodder excels all others*. Thus the Filipino farmer can not only supply his family and domestic animals with a most nutritious food and sell the surplus grain at a good profit, but he can also dispose of the heretofore practically unutilized portions of the plant, to wit, the leaves, tops, and husks.

One feature of the maize question of the Philippines which requires attention on the part of both producer and the wholesale merchant is the storage of the grain in bulk. This matter is now being studied by the Bureau and we may say that there appears to be no great difficulty in storing the grain, provided that proper weevil-proof cylinders or tanks are used, and provided that the maize is thoroughly dried before putting into these storage receptacles. Fumigation in storage, while not always practicable for the small farmer, presents no serious difficulties to the merchant.

SOYBEANS.

Probably every tourist who has visited any of the cities of Japan or China has noticed in the markets these peculiar blocks of a grayish white, jelly-like substance and wondered whether they were really good to eat, but comparatively few have ever tried there the three or four varieties of vegetable "cheese" prepared from the soybean.¹ Just across the China Sea our neighbors of Cochin China and Indo-China are now, and have been for a long period, relying to a considerable extent upon the soya or soybean to give a variety in their diet.

Experts in threpsology, the new science of nutrition, seem to be

¹ At least five preparations are commonly made in Japan from the soybean. These are natto, tofu, miso, yuba, and shoyu.

Natto is prepared by boiling the beans in water for five hours to render them very soft. The hot mass is then wrapped in small portions in straw and the bundles, securely tied at both ends, are placed in a cellar in which a fire has been kindled. The cellar is then closed for twenty-four hours and the cooked beans allowed to ferment in the warm, moist atmosphere. The fermented product is a thick, viscid mass and has a peculiar but not putrid odor.

Tofu, or bean cheese, is prepared as follows: The beans are soaked in water for about twelve hours, and crushed between millstones until of a uniform consistency. The ground material is then boiled with three times its bulk of water for about an hour, and filtered through cloth. The filtrate is white and opaque, having somewhat the appearance of milk. It has, however, the taste and smell of malt. This milky liquid, to some extent, resembles cow's milk in composition.

The protein in soybean milk is precipitated by adding the mother liquor obtained in the manufacture of salt from sea water, which contains considerable magnesium chloride. The precipitate is filtered off and formed into cakes with the hands. It is eaten in the fresh state or frozen. In the latter case it loses part of its water.

Miso is prepared from cooked beans, which are rubbed to a thick paste and fermented with rice-wine ferment. Miso is of two kinds, white and red, and to some extent resembles tofu.

A sort of film forms on the surface of soybean milk which in appearance suggests cream. This material is sometimes prepared in quantity by evaporating the milk, and when dried it is used as an article of food under the name of yuba.

Shoyu is a sauce prepared from a mixture of cooked and pulverized soybeans, roasted and pulverized wheat, wheat flour, salt, and water. The mass is fermented with rice-wine ferment in casks for from one and a half to five years, being very frequently stirred. The resulting product is a moderately thick brown liquid. In odor and taste it is not unlike a good quality of meat extract, though perhaps a trifle more pungent. Under the name of soy sauce it has been known in India, and to some extent in Europe, for many years. (Extract from "Soybeans as Food for Man," by C. G. Langworthy, Ph. D., Farmers' Bulletin No. 58, United States Department of Agriculture.)

in accord on the fact that in dietary matters two kinds of food are at least four times as good as one, and four kinds of food are probably eight times as good as two; in other words, it is physiologically very unsafe for a human being to depend upon one, or even two, kinds of food. Most people are now familiar with the principles of this new science, and even school children know that the "daily ration" must be "balanced" as to proteids and carbohydrates.

The soybean contains comparatively little starch, but this lack is made up for by the very large amount of protein, or vegetable albumen, which is the basis of the so-called cheeses, or casein products made from this legume. By grinding the seed to a fine meal and dissolving this in water, a kind of vegetable milk is formed which may be passed through a coarse filter and then coagulated usually with a minute quantity of some harmless mineral powder; upon coagulating, this "cheese" may be allowed to slightly ferment, thus forming a grayish or yellowish substance, or it may be dried rapidly without fermentation, or cooked and then partially dried. By the latter method a solid, very nutritious substance resembling goat's-milk cheese is obtained. A kind of condensed milk and a sort of thick cream may also be prepared from a concentrated solution of soybean flour.

Recently the European food experts have realized the high nutritious value of the soybean and a factory has been established near Paris for the manufacture of various food products from this wonderful seed. It is said that a new condensed ration tablet, which will be of great use to travelers and soldiers, has been put on the market; it is composed of soybean casein combined with several other substances and is believed to contain about the maximum of nutriment with the minimum of bulk.

The United States has recently begun the exploitation of soybean culture and several results have already been attained: First, a variety, or rather a number of varieties constituting a "type," have been introduced from Japan into the rice region of the southern States and by growing these wet-land varieties after the main crop on the rice fields, the soil is considerably enriched by the nitrogen stored up in the soybean roots, and by plowing under the plants the texture of the soil is vastly improved, so that the yield of rice is remarkably increased; secondly, it is found that several varieties of soybeans contain from 15 to 25 per cent of an oil which has various economic uses and the residue "cake" is a high-grade stock food, this branch of the industry alone amounts to many thousands of dollars per annum; thirdly, it is grown as a silage crop, and although too coarse to

feed green, it is run through the silage cutter and mixed with maize fodder, the two materials thus forming a much better ensilage than either would be if used separately.

Though a comparatively new crop outside of the Far East, soybeans are being carefully studied and within a few years there will undoubtedly be, by the process of artificial selection, a goodly number of practically new varieties; moreover, the number of secondary by-products to be derived from the grain will increase and become important items in commerce; "Shoyu" sauce made from the soybean is now used, under various names, in both Europe and America as a meat relish.

The wet-land varieties of soybeans can be grown on the irrigated rice fields throughout the Philippines, while the ordinary varieties should do well on soils which would produce maize and similar crops. Being a legume, the soybean is not dependent upon vegetable matter for the supply of nitrogen in the soil so much as most other crops; when closely planted the growth is usually so rapid and dense that weeds and grass do not interfere to any great extent. Now is the time for the Philippine agriculturists to take up soybean culture in earnest, and to develop it in the same way, even if not to the same degree, as our neighbors across the way have been doing for centuries. The fact that there are practically no seeds of this valuable crop at the present in the Philippines is a sad commentary on the progressiveness of the Philippine farmers; but it is never too late to learn.

SORGHUM.

Three or four distinct varieties of sorghum, commonly called "batad," have been cultivated for a considerable time in the Archipelago; however, because of the inferiority of the varieties grown here, as compared with the sorts grown in America, India, China, and Africa, this grain has not entered largely into use here as a table grain. The seeds of all varieties are excellent feed for poultry, and, of course, may be fed to pigs and cattle as well. The difficulty in using the small-seeded varieties is largely in hulling, grinding, and freeing the flour from the "bran."

Generally speaking, the sorghums require less rain during their growing season than the maize varieties. This fact, together with their very rapid growth and heavy yield of seed make the crop one which should be given much more attention than it receives at present. While not so rich in oil and gluten as maize, there is no question but that sorghum grain made into meal is almost as valuable for the table and for feeding domestic animals, poultry, etc., as the former. Throughout the entire

Continent, as well as large districts in India, south and eastern Asia, these sorghums are very largely grown and in many districts they furnish the *chief article of diet*. At least 200 named sorts are grown in India and the number cultivated from the Sudan to the Kalahari desert is probably not less than 50, and may be nearly 100. The writer once measured stems in a field of sorghum grown by the Ronga Kafirs of Mozambique and found that some of the stems were about 6 meters (over 19 feet) in height. As grown by the Kafirs in East Africa the plant runs very largely to stem instead of seed, through too close planting, but even under adverse conditions a yield of grain in the fields of these savage tribes is probably twice or three times the yield of maize on the same area. One of the types, or groups of varieties, of the sorghum are now known as "kafir," on account of their origin among the Kafir tribes of southeast Africa. Eastern China has furnished another class of sorghums known as the "kowliangs;" these are rapidly gaining favor in the great sorghum belt of the Middle and Western States. Another type, comprising the "durras," are supposed to have originated in Egypt and the Levant; still another group, the "milos," are largely grown in India.

Nearly 350,000 hectares of land are now planted in sorghum in the State of Kansas alone, while Oklahoma has probably about the same amount. The yield of the grain sorghums of America is from 25 to 45 bushels (750 to 1,000 liters) per hectare; the value of the grain is about 80 to 90 centavos per bushel ($2\frac{1}{2}$ to 3 centavos per liter), which gives a hectare value of about ₧30 for the grain alone. The yield of forage is about 7 to 8 tons per hectare.

New varieties are continually appearing on the American market, largely due to artificial selection on the part of intelligent farmers who have learned the method from their experience in growing corn and other grains, and in this they have been very largely assisted, of course, by the various experimental farms and stations of the Department of Agriculture.

The proportion of seed to the weight of the entire plant is gradually increasing. "One plat of milo at the Dalhart experimental farm, Texas, in 1908, yielded 47.2 per cent of its weight in grain."¹

The Bureau of Agriculture has grown sorghum for several seasons at the Alabang stock farm, with uniformly excellent results. However, it is proposed to introduce a considerable

¹ Farmers' Bulletin 448, U. S. Department of Agriculture: "Better Grain-Sorghum Crops."

number of better varieties from America and other countries and to try them out at the various experiment stations of this Bureau during the coming year. Some of the varieties which are suitable only for forage will be tested at the various forage testing stations, under the direction of Col. J. C. Gresham, of the quartermaster department, United States Army. It should be remembered that sorghum gained its prominence in America not so much through the yield of grain as from the fact that some of the first varieties to be introduced were very rich in sugar, and are still used, to some extent, in the production of sorghum sirup; unfortunately it is difficult to crystallize this sirup, so that it is probable that no sorghum will ever be able to compete with cane and sugar beets.

Among other crops which should be grown in the Philippines to break up the single-crop idea—which has unfortunately held such a prominent place in Philippine agriculture—may be mentioned the following:

Peanuts, inferior varieties of which are grown to some extent in nearly all provinces of the Archipelago.

Taro, or *gabe*, inferior varieties of which are grown to a limited extent, especially in the Visayas.

Yautias, which were introduced by the writer and Mr. Wm. S. Lyon from tropical America in 1904, but which have never received more than a small fraction of the attention they deserve as first-class root-crops.

Cassava, a few varieties of which are cultivated to a slight extent in some districts, but which are seldom used as they should be in the preparation of dried flour, tapioca, etc.

Yams, or *ubis*, which are recognized as valuable foods throughout the tropics, but generally speaking, only inferior varieties of which are used, and then mostly by the savage tribes in this Archipelago.

Beans, the lack of interest in which is, according to dietitians, largely responsible for many of the physiological evils and probably some of the diseases occurring throughout the Archipelago.

Cowpeas, which are grown to a limited extent, but which for various reasons are not sufficiently well known.

And last but not least, the coconut could be utilized as human food to a much greater degree and in more ways than at present. It is said that "one ripe nut per meal per man is enough."

THE PROPAGATION OF THE AVOCADO.

By P. J. WESTER, *Horticulturist*.

The fact that the avocado (*Persea gratissima*) will thrive and fruit in the Philippines is now being established beyond doubt, as trees introduced in 1903 by the Bureau of Agriculture are this year bearing their second crop. A short exposition of the experience gained in the propagation of this fruit by the writer during seven years' study of tropical fruits in south Florida may, therefore, be of timely interest. The method described has been used repeatedly on a large scale by the writer, as well as by others, with uniformly good results.

The seed of the avocado is very susceptible to injury from fungi and loses its viability very rapidly by being exposed to the air, and it should, on that account, be planted as early as possible after it is taken from the fruit. Where delay is unavoidable, the seeds should be covered by moderately moist soil. Seeds treated in this way can, however, be left for a short time only, as germination, in most cases, starts very early, much more so than in the seed of the mango.

There are two methods of propagating the young plants: (a) To grow and bud the stock in pots or boxes, and (b) to plant the seed in the nursery, bud the stock there, and afterwards take up the budded plants, transplant them to boxes or pots, and grow them in a plant shed until they are large enough to set out in the field. The direct transfer of plants from the nursery to the field has never been done on an extensive scale, as far as the writer is aware. In Florida, where on account of the sandy character of the soil this does not adhere well to the roots, the avocado transplants with more difficulty than citrus trees, but it is quite probable that in loamy and clayey soil where the plant can be taken up with a ball of earth around the roots, it could be moved without serious trouble.

If the plants are to be grown in pots or boxes the seed should be planted in pots 15 centimeters in diameter, or boxes 12 to 15 centimeters in width and 25 centimeters in depth. The bottom

of the pot or box should be covered with broken potsherds, coal ashes, small stones, or gravel, to provide proper drainage, and the seed should be covered about 15 to 20 millimeters with soil. Sandy loam, rich in humus, is good potting soil. After planting the seed, the pots should be plunged in a frame in a plant shed, giving about half shade, and should be covered with a thin layer of straw or leaves to prevent evaporation and washing out of the soil by the usually heavy fall rains. The watering required is usually, at this stage, very slight, but the pots should be looked after frequently to see that the soil does not dry out, nor, on the other hand, should the soil be kept wet and soggy by excessive watering. In two or three weeks after planting the first plants begin to appear above ground, and as they reach a height of 15 to 25 centimeters they are shifted to another frame and given more room. Sturdy plants are obtained only by giving them plenty of room, other conditions being favorable. As soon as the plants in pots are about 25 to 30 centimeters high they are shifted to a larger sized pot, 17.5 to 20 centimeters in diameter, and may be budded as soon as they have attained the thickness of a lead pencil. The plants should remain in the boxes until they are planted out. If the plants are grown in pots or boxes a plant shed should be erected, constructed so as to give half shade to shelter the plants from wind and sun.

No one who is not well versed in the care of potplants should attempt to grow the stock-plants and bud them in pots or boxes, or else the result is sure to be discouraging—if not a complete failure. It takes an experienced man to keep the plants not only in a growing condition, but in a condition of perfect health with the sap flowing freely, and in condition for budding. To do this the plant should receive a certain amount of water from day to day and this only a trained man can rightly gauge. If overwatered the soil sours, the roots decay, and the growth of the plant is suspended; if too little water is given, even for one day, the cambium layer dries up and the bark sticks to the wood as if glued; in either case budding is impossible. Also, the plants should be examined every three weeks, if not oftener, and all roots that have started to grow through the drainage vent cut off. If this is not attended to the greater part of the root system of the plant will soon have formed outside of the pot. The avocado is a voracious feeder and soon exhausts the available food supply in the pot, and the fertility of the soil must be renewed by arti-



PLATE II —POT-GROWN, BUDDED AVOCADO (LESS THAN ONE YEAR FROM THE PLANTING OF THE SEED, READY FOR PLANTING IN THE FIELD).

(By courtesy of David Fairchild, Bureau of Plant Industry U S D A)

ficial means. Where cow manure is available, this may be mixed with water, strained through a sieve or a coarse cloth into a barrel and diluted until it assumes the color of weak coffee; the plants should then be watered with this mixture once in two or three weeks, according to their condition. Frequently manure is not readily obtainable, however, and resort must be had to artificial fertilizers. Only the most soluble chemicals should then be used, those that furnish a plant food immediately available. The writer has for several years used the following formula for many kinds of tropical plants (including the avocado, mango, anonaceous plants, guavas, etc., and different species of palms), applied at intervals as directed for the manure water, with highly satisfactory results:

Nitrate of soda	grams.....	275
Sulphate of potash, 49 per cent	do.....	125
Acid phosphate, 16 per cent	do.....	350
Water	liters.....	100

Care should be taken to see that all the constituents are well dissolved. The acid phosphate has a tendency to settle at the bottom and the solution should, therefore, be stirred up now and then.

If the plants are to be budded in the nursery the seed should be planted about 20 centimeters apart and covered with 15 to 25 millimeters of soil in rows laid off 1 meter or more apart to suit the convenience of the propagator. If the soil is dry the land should be well irrigated after the planting of the seed, and the rows where the seed is planted covered with a mulch of straw, leaves, or seaweed. In order to induce the plants to develop a better lateral root system the rows should be gone over when the plants are about 15 centimeters high and a sharp-edged spade thrust diagonally into the ground under each plant, cutting off the taproot about 10 to 12 centimeters below the surface of the ground. The weeds should be kept down by frequent shallow cultivation. Deep cultivation should be avoided.

For propagating work in the nursery, the simplicity of the method, the rapidity with which the work may be performed, coupled with great economy of material—a valuable feature where this is scarce—renders the method of shield-budding preferable to all other methods of propagation. The avocado, fortunately, responds well to this method.

Much has been said about the difficulty of budding the avo-

cado, particularly in regard to the failure of the buds to start, though *if proper conditions are observed* it is only slightly more difficult to bud than the orange or the peach. The principal difficulty, according to the writer's observations, has been mainly with the operator, who has lacked the manual skill necessary for success and the good judgment necessary for the selection of buds; not infrequently it has been due to a poor budding knife. Budding and grafting of a plant are analogous to a surgical operation on a human being, but the man who would be horrified to see a surgeon pull out of his pocket a rusty and dull jackknife to perform an operation will frequently go and bud avocados or other plants with just such a knife and then wonder why so many buds failed to grow. The wonder is that any could grow at all. Not only should a budding knife made expressly for the purpose be used for this work, but it should be absolutely clean from all impurities and have an edge keen as a razor. A small whetstone and leather strop should be included in the working toolkit so that the knife can be sharpened as needed. The writer, in his budding work, frequently tests the keenness of the blade on his forearm; if too dull to smoothly shave the hair the knife is ground or honed before another bud is cut.

Budding should never be attempted unless there is a good flow of sap so that the bark separates readily from the wood. Old hard budwood should not be used, for—unlike the citrus, anonaceous fruits, and several other plants, the buds of which are sunk into the bark tissue and from which new buds issue if a sprouting bud is broken off—the buds of the avocado are mostly raised above the bark; consequently if a bud fails to sprout, it frequently falls off even before the leaf itself has dropped, thus leaving a blind bud incapable of producing any growth whatever. Because of this feature of the avocado and the tendency of the old buds to drop, the use of old budwood will always be accompanied by a certain percentage of loss from buds going "blind" even after a perfect union between stock and scion has become established. Another reason for the failure to get the buds to sprout, complained of by some propagators, is that the buds are cut too small and that the leaf buds proper are small and poorly developed and unable to start before the rapidly growing callus around the bud smothers it. The importance of the selection of budwood from the current year's growth—sufficiently mature so that it does not snap on bending, carrying

vigorous and well-developed buds that are not crowded on the budstick, thus allowing the cutting of large buds—cannot be too strongly emphasized. Suitable budwood may be “made to order” by manuring the trees heavily with nitrogenous fertilizer and irrigating them a few months before the budwood is wanted.

After the wood has matured as indicated there need be no fear that it is too tender. In fact, the tenderest full-grown buds may be used with success in the hands of a skilled budder. The writer has frequently used the tip of a budstick, inserting it as a “sprig bud,” with good success. The bud should be inserted as near the ground as possible, for this will save much time later otherwise consumed in rubbing off adventitious buds, and the buds also have a tendency to start easier when inserted near the ground than when placed higher up on the stock. In countries where light frosts may be expected during the winter, it gives better opportunity to protect the bud by banking the tree with soil than if the bud is inserted far above the ground.

In making the opening in the stock to receive the bud, make a vertical incision about 35 to 40 millimeters long, at the lower end of which make a horizontal incision as shown in Plate I (c). Then lift the bark by passing the point of the blade under the bark upward from the horizontal incision making a wound suggesting an inverted T. The T bud may also be used and the bud is then pushed downwards, but the inverted T bud has been found to be the more advantageous and expeditious method. The bark should be lifted sufficiently so that none but the gentlest pressure is needed to insert the bud in position. Now cut a bud, of the size shown on the accompanying plate, by passing the knife diagonally under the bud, taking care not to cut the bud too thin and that no tear or break is made in the tissue; place the bud in position and tie firmly—but not tight enough to strangle—with grafting tape; begin at the horizontal cut and cover the entire bud to prevent its drying out and to prevent access of water. In the light of the experiments conducted by the writer the avocado may be budded at all seasons of the year; however, in large practice it is best not to bud at the approach of the dormant period for the reason that the buds then sprout with more difficulty than at other seasons, in the meantime being in danger of becoming callused over.

For tying material, raffia, soft cotton string, or grafting tape is used. The writer has found grafting tape preferable, as it prevents the drying up of the bud before circulation has been

established between scion and stock and excludes all extraneous moisture, which, when other tying material is used, frequently enters the bud and destroys it.¹

If the weather is warm and the stock is in growing condition, the union will take place in two weeks, some times even in a shorter period, and the buds are then unwrapped to below the leaf bud, and the top of the stock lopped about 7 to 10 centimeters above the bud. If, on examination, it is found that the union has not yet been formed, replace the wrapping for another week. It is important that in a vigorous and rapidly growing species like the avocado, the unwrapping and lopping be attended to as soon as there is a good union, as otherwise the callus soon grows over the bud and smothers it before sprouting—one of the difficulties experienced by amateur operators. In order to force the bud to start it is no less essential that all adventitious sprouts be rubbed off as soon as they make their appearance.

After the bud has made a growth of 15 to 20 centimeters and ripened up its wood the stock should be trimmed off by a sharp knife immediately above the bud. The cut should be covered with grafting wax or paint to prevent the entrance of fungi which, if this is not attended to, frequently enter the wound and destroy the bud. The fungi not infrequently enter the stock through the wound that is made at the point of lopping the stock, working downward until they destroy the bud; they are recognized by the brownish appearance of the bark and wood. The only means by which a budded plant attacked in this way may

¹ A wax preferred by the writer in grafting or for making wax cloth is made of equal weights of beeswax and rosin. Other recipes are: rosin, 3 kilograms; beeswax, 1 kilogram; linseed oil, 0.5 liter or: rosin, 2 kilograms; beeswax, 1 kilogram; tallow, 0.5 kilogram.

The wax is prepared by placing the ingredients in a suitable iron pot and melting them over a slow fire. Liquid wax may be made by melting 1 kilogram of wax made according to the last recipe mentioned and adding 0.75 liter of alcohol; mix thoroughly and keep in a tightly corked bottle.

The best material for grafting tape is cheap cotton cloth that tears easily; tear up the cloth into strips 15 to 20 centimeters wide; wind the strips of cloth on stout iron wire until the roll is not more than 4 centimeters in diameter; if thicker the wax will penetrate with difficulty to the center. To prevent the cloth from being undone tie a string around each end of the roll. The weight of the wire causes the rolls to sink in the mixture while the cloth absorbs the wax; if sticks of wood are used on which to wind the cloth the rolls should be weighted down. Place the rolls in the melted wax which will saturate the cloth in about fifteen minutes. Do not place the rolls of cloth in the mixture in a *boiling* state or the cloth may be burned. When ready to use unroll the cloth and tear it into strips about 20 millimeters wide.

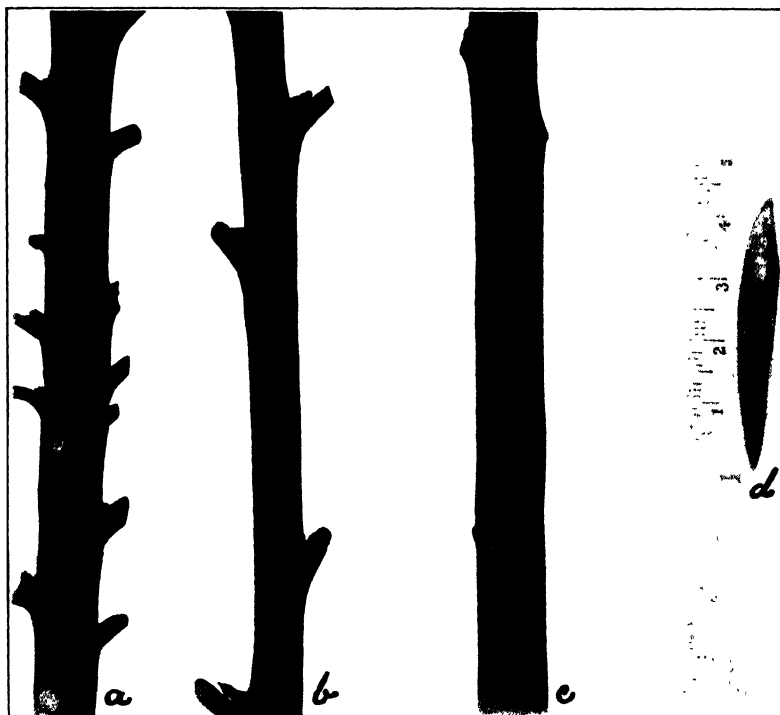


PLATE III SHIELD-BUDDING THE AVOCADO

(a) Rejected budstick, (b) ideal budwood, (c) bud inserted before tying, (d) bud
 (By courtesy of David Fairchild, Bureau of Plant Industry, U S D A)

be saved is by trimming off the stock to the bud and covering the cut with grafting wax, linseed oil, or paint.

After being trimmed the plant is left in the pot until the wound is healed, when it is ready for planting in the field. If the pot-grown plants have been given good attention and budded at the proper time the majority should be ready for the field a year from planting the seed—the more precocious even earlier. In a well-conducted nursery all stocks should be budded before they are six months old.

Where the plants are transferred to boxes before planting out this should be done after the wound is fairly well healed up. Before taking them out of the ground prune off about one-third of the foliage. Great care should be exercised to prevent the roots from drying out or from being bruised. In “boxing” the plants, carefully work the soil in among the roots and allow them to remain in as natural a position as possible. Water the plants thoroughly and keep them well shaded for a few days. When they have thoroughly established themselves they are ready for transplanting to the field.

THE TOBACCO BEETLE AND A METHOD FOR ITS CONTROL.

(*Lasioderma* spp.)

By DAVID B. MACKIE, *Agricultural Inspector.*

It is safe to state that there is no insect which causes greater concern to the manufacturer of Philippine tobacco products, and yet against which so little has been done in the way of eradication, as the tobacco beetle. The annual loss due to the operations of this beetle is far in excess of what it should be, the actual money loss from returned cigars which are infested with the insects being estimated at more than ₱500,000 per annum. Unless some measures are taken to control this insect this loss will increase correspondingly with the number of cigars exported, and it can be readily seen that if the present conditions continue, it will be only a short time until the foreign markets will refuse Philippine cigars for just this reason. The author has already observed articles in certain publications devoted to tobacco interests in which the prevalence of beetles in the Manila product is mentioned.

Before dealing with the method of eradication it may be well to give a brief outline of the habits and distribution of this insect. It is supposed that the Philippines were the original home of this beetle as it was first described from beetles found in shipments of cigars received from these Islands. At the present time the insect is almost cosmopolitan and is found in all parts of the world. In reality, the name "tobacco beetle" is a misnomer, as the insect by no means confines its attention to this product alone. According to reports it has been found in dried fish, snuff, red pepper, opium, ginger, paprika, fish guano, and in certain prepared stock-foods; it also works destruction in dried herbarium specimens. In tobacco the insect does not confine its operations to any particular product, being found in all classes of dried tobacco. It is to the finished product, however, such as cigars, that the greatest loss occurs, as the insect seems to prefer the lighter and milder leaves, which are of

course the most expensive. Cigars infested with these beetles can only be chopped up and used in the manufacture of cigarettes. Those which contain beetles can readily be detected by small, round holes which often run entirely through the cigar. If the perforation does not go entirely through, it often will wind around through the interior leaving a series of chambers in which the filler is eaten out and a mass of dust left in its place. Such cigars are useless from the fact (1) they do not draw; (2) they do not burn evenly; (3) the dust is drawn into the mouth of the smoker.

While it is sometimes thought that the eggs are laid on the tobacco and made up into the cigar, the young larvæ hatching out in the interior, yet, after a study of the insect, it seems that the mature beetles often eat their way into the interior—either by boring through the wrapper or entering at the open end—and deposit their eggs in the cavity, or between the packed cigars, thereby insuring them protection. These eggs are very small and can hardly be seen with the naked eye. They are white and hatch in about eleven days. The young grub immediately begins operations by boring about in the cigar. When first hatched it is almost invisible and is whitish and covered with fine, soft hairs. On reaching maturity, the grub eats its way to the surface and after making a rude cocoon of particles of tobacco refuse, stuck together with a small amount of silk or other salivary secretion, transforms into a pupa. About fifteen days later the mature insects emerge. In packed cigars that have been infested for any length of time the old cocoons may be seen attached to the cigars or in corners of the box. Mature beetles are about 3 millimeters in length, the males being slightly smaller. They fly off in search of mates, and unlike some species, they do not mate and immediately die, but continue to feed for some time, during which they bore into the cigars in the same manner as the larvæ. They are most active during the night, flying about seeking a place in which to lay their eggs. From the custom in vogue in these Islands of drying the cigars on trays placed in the open air, it can be readily seen why such a large percentage of cigars are infested with this pest, as it takes from eight to fifteen days (according to the weather) to dry them out sufficiently, and being exposed during all this time to the attacks of the beetles, it is hardly to be wondered at that so large a percentage become infested. Of the natural conditions affecting the increase or decrease of this insect, by far the greater number are favorable to the pest. Among these are:

- (1) The climate is such that the insect can breed throughout

the year (in the temperate zones, the cold season acts as a check).

(2) Sheds and other places in which dried tobacco is stored are open and airy, being mostly frame structures, and accordingly contain many chinks and cracks which afford an abundance of shelter and breeding places for the beetle; this same is true of the factories.

(3) Almost no care is taken or efforts made to keep the beetle under control.

(4) There is considerable ignorance in regard to methods of destroying this pest.

To prevent the beetle from attacking the baled tobacco would require an entirely different method of handling from that now used, yet to free the finished product from the beetle is a comparatively simple matter and one within the means of all cigar manufacturers. This method is not new, as it has been in use in the United States for over ten years, but still it is an innovation in the Philippines. It consists of subjecting the finished product (i. e., the finished cigars) to the fumes of some poisonous gas that will kill all the beetles, grubs, and eggs. The matter of taking up this project on a large scale was suggested by Mr. Otis W. Barrett, chief of the division of experiment stations, about the middle of March, 1911, when, in company with Mr. R. W. Rowe, the tobacco expert of the Bureau, he visited some of the cigar factories in Manila for the purpose of ascertaining what steps had been taken to control this pest. It appeared that in only one case had the manufacturers given the matter much consideration; they had made some experiments with carbon bisulphide, and had also tried subjecting the finished product to a *freezing process*, believing that this might kill the beetles.

As this matter was one of considerable economic importance, it was decided to take it up officially and the writer was assigned to conduct a series of tests and demonstrate the possibilities of eradication. It will be seen that to successfully reach all insects in cigars a gas must be used, since a liquid might be injurious to the product and to the consumer as well. The gas must necessarily be very poisonous and at the same time of a very penetrating nature, and yet leave no trace upon the tobacco. The writer, being familiar with the uses of hydrocyanic acid gas and carbon bisulphide as insecticides, decided to give these compounds a thorough tryout and ascertain whether or not there would be any trace of the poisons left in the cigars. The matter was taken up with the proprietor of one of the large factories, who not only expressed his desire to adopt any necessary preventive

methods which might be available, but gladly constructed the necessary cases in which to conduct the experiments. Hydrocyanic acid gas is one of the deadliest poisons known to science and is developed from cyanide of potash, sulphuric acid, and water. The gas is liberated by adding the cyanide to the sulphuric acid, which is diluted with water. To illustrate the extremely poisonous nature of the gas, it might be said that one full inhalation is sufficient to cause death.

To determine the correct amount of poison necessary to kill all the beetles in infested cigars, it is first necessary to ascertain the cubic contents of the box in which the cigars are to be placed. This box must necessarily be as nearly air-tight as possible. Experiments have shown that cyanide of potash at the rate of 15 grams per cubic meter of space is sufficient to destroy the beetles. This should be multiplied by the number of cubic meters contained in the case. If the case were 2 by 1 by 1 meters we would have a volume of 2 cubic meters, and at 15 grams per cubic meter, we would need 30 grams of cyanide of potash to generate our gas. The amount of acid necessary is one and one-half times the amount of cyanide, and the water two times the amount of the acid. Thus we would need 30 grams of cyanide, 45 grams of sulphuric acid, and 90 grams of water. In regard to these chemicals it should be remembered that only pure products should be used, the cyanide being not less than 98 per cent pure and the sulphuric acid the same. In mixing the ingredients the author found that a large graduating vial served the purpose very well, yet it makes little difference as long as the vessel is of sufficient depth so that the ingredients do not overflow during the violent agitation which takes place when they are mixed. The water should be placed in the generator, and the sulphuric acid added—care being taken to add the sulphuric acid to the water, and not the water to the sulphuric acid, as if this latter is done an explosion is likely to result. By the combination of the acid and water, heat is generated, and the mixture becomes very hot. The cyanide is then tied up in a paper, and everything being in readiness, the package is dropped into the vial containing the acid and water. The acid eats through the paper in a few seconds and the hydrocyanic acid gas is liberated. A violent agitation takes place, the mixture frothing and bubbling as the whitish gas escapes. This gas is lighter than air, is very penetrating, and kills all animal life that may exist. Whenever it is desired to open the case, whoever opens it should use great care not to breathe or inhale any of the gas and the case should be left open at least fifteen minutes before

examining the contents. If the generation is good, the residue should be a bluish liquid with but little sediment.

In connection with the experiments conducted by the author, the case used was slightly larger than the one above mentioned; it was lined with tin, fitted with clamps, and strips of extra heavy felt were attached where the covers fitted to insure the confinement of the gas. This case had a capacity of about 6,000 cigars, an amount which was large enough to demonstrate the success of the method. To this case was attached, by a piece of 1-inch hose, a generator with a capacity of 2 cubic feet, and a glass panel was inserted in the door so the operator could observe the generation while taking place. In preparing cigars for treatment they were tied up in bundles the same as they come from the makers; these bundles were then placed in the case in wire trays made for this purpose; the cover was then clamped down and strips of paper pasted along the union, so that the case was practically air-tight; the sulphuric acid was measured out and added to the water; the cyanide was done up in a small paper sack and hung inside the box by a string running up through a small hole in the cover of same; the jar was then placed in the generator box directly under the suspended cyanide, and the door closed and sealed with strips of paper pasted along the cracks. Everything being in readiness, the cyanide was lowered into the glass; a few seconds were sufficient for the acid to eat through the paper, and a violent agitation then took place, the mixture frothing and seething and, at the same time, giving off mist-like fumes. A slight accidental inhalation through the nostrils produced a choking sensation and an inability to speak for several minutes.

These trials involved the fumigation of over 25,000 cigars, all badly infested with beetles in the various stages of development from the egg to the mature insect. The most important of these tests was one in which nothing but eggs were used. It will readily be seen that upon the ability of the poison to render the eggs sterile depends the success of the method. Eggs which were submitted to hydrocyanic acid gas for twenty-four hours were kept under observation for more than two months without the appearance of the young larvæ, though the usual period of incubation is but eleven days. In these trials with hydrocyanic acid gas the chemicals varied in strength from 8 to 15 grams per cubic meter, the latter being rather stronger than was necessary.



PLATE IV—CASE USED IN FUMIGATION EXPERIMENTS WITH THE TOBACCO
BEETLE (CAPACITY, 6,000 CIGARS).

*Carbon bisulphide.*¹—The gas developed from this compound is much heavier than air, being one of the heaviest gases known. It is released by simply placing the liquid in a shallow dish in the upper part of the case and allowing it to evaporate. Evaporation takes place rapidly and the gas settles to the bottom. This gas, while not as powerful as hydrocyanogen, is deadly to all animal life; while not as dangerous to inhale it is highly explosive and should not be used near a fire nor should there be any smoking in the vicinity at the time it is being used. Experiments have shown that if used at the rate of 15 grams per cubic meter, all insects will be destroyed. To some it may seem preferable to use this gas on account of the highly poisonous nature of the hydrocyanogen.

While bisulphide readily kills the mature beetles and larvæ, yet to secure complete destruction of the eggs it is necessary to subject them to this gas for a much longer period, forty-eight hours being the very least time which can be relied upon to sterilize the eggs. However, as it is so very easily handled, it will naturally recommend itself to many, and if the product is subjected to it for a sufficient length of time, there is no doubt but that good results will be obtained.

Formaldehyde.—Trials were made in which formaldehyde was substituted for hydrocyanogen. This gas is generated by two different methods, first, by simple evaporation, through the application of heat, and second, by the addition of potassium permanganate. In this latter trial, one part liquid formaldehyde was used to two parts of permanganate, in the proportion of 2 to 1 of grams and cubic centimeters, respectively. The amount used in each case was greater than is ordinarily used in fumigation methods. The generation was perfect and the gas was very strong; nevertheless specimens of the insects, in all stages of development, were found to be living and in no wise affected by the gas even after being subjected to its influence for twenty-four hours. This was rather surprising, but subsequent tests resulted in the same conditions. Where the liquid was simply evaporated in the generator the effect was the same. Judging from the results obtained by this method, it is safe to say that it is of little value as a killing agent.

The question naturally arises as to whether there will be any noticeable effect on the cigars after having been subjected to the

¹ The commercial article is known as "Fuma" and is manufactured at Penn Yan, N. Y., U. S. A.

fumes of these gases. This matter has been given careful consideration and in no instance could any trace of the gas be detected on cigars after they had been aired for fifteen minutes. Cigars which had been exposed to hydrocyanic acid gas for twenty-four hours, and had been aired for only five minutes, were smoked by the writer and others—among whom were tobacco experts—and the opinion was unanimous that the flavor or aroma of the cigar was in no wise impaired by its treatment with the gas. In those subjected to the bisulphide of carbon a slight taste of the gas could be noticed in the first draft only; this was due to the gas that remained in the interstices of the filler, it not having had time to be disseminated. However, after an hour had elapsed, no trace of the gas could be noticed.

The cost of treating cigars by these methods is very low, being less than ₱1 for enough chemicals to eradicate the beetles from 20,000 cigars. This price is well within the reach of merchants who handle tobacco products, and it seems as if there is no reason why the market for Manila cigars should suffer from the prevalence of these insects.

It is to be hoped that all exporters of Philippine tobacco will supply themselves with the inexpensive equipment necessary and free their tobacco products from this pest before shipment to other countries.

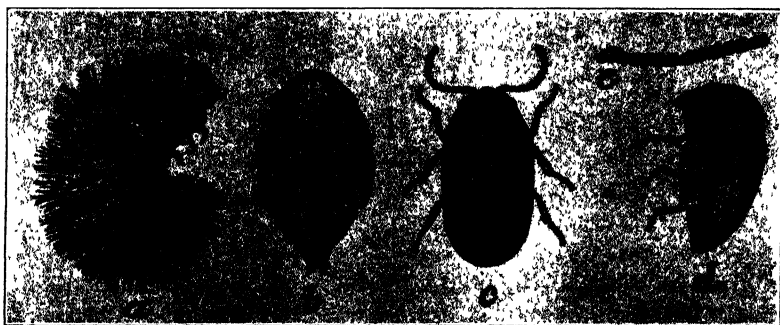


FIG. 1.—Tobacco Beetle (*Lasioderma serricorne*). (After Chittenden.) a, Larva; b, pupa; c, mature beetle; d, side view; e, antenna.

BALING OF FIBERS.

By M. M. SALEEBY, *Fiber Expert.*

The question of the proper preparation and baling of fibers has not so far been given its due discussion in any of the fiber publications of this Bureau. The following notes are intended to explain the present methods practiced by the majority of the fiber producers and buyers in preparing and baling abacá and maguey, and to suggest improved methods that will help to put these fibers on the market in the best possible condition.

Baling of abacá.—The majority of the abacá planters prepare their fiber for the market in the following manner: The fiber is tied in small bundles (madejas) ranging in weight from 4 to 14 kilos each, and is usually twisted tight in a manner similar to that used in making the strands of a rope. Six or more of these small bundles are then tied together by means of twisted strands, forming a large bundle or bale (bulto) that weighs from 34 to 45 kilos, or more. In some instances the butt end of each of the small bundles is tied in a spiral manner with a few strands of fiber, thus giving it a conical shape, which is intended to cover up the irregularities in the ends of the fibers and give the bundle a more artistic appearance. The butt end tied in this manner is called the "head." The provincial buyers and balers, in order to save themselves the trouble and expense of untying such bundles, often press these bundles as they receive them. On account of this the shippers of the fiber in Manila and Cebú sometimes find it necessary to open the bales, untie the bundles, and rebale them in a manner satisfactory to the manufacturers.

In classifying the quilot grades of abacá, which are generally considered the highest grades, it is an established custom to tie the small bundles in little knots at the butt end, in this way marking these grades so that they can be easily recognized.

Baling of maguey.—The common method used in preparing maguey for the market is similar to that used in preparing abacá, with this difference: in the maguey the butt ends of the small bundles remain loose. The small bundles are tied very tight

10 to 20 centimeters from the butt, while the remainder is twisted like a rope. Ten to fifteen of these small bundles are then tied together, in which condition they are transported to the market.

The disadvantages of the above methods of baling both abacá and maguey are four: First, it requires a considerable amount of time and expense on the part of the producers to tie the fiber in this manner; second, a large amount of fiber is wasted in making the strands and loose ropes with which these bundles are tied; third, it requires a large amount of trouble and expense on the part of the manufacturers to open such bales; and, fourth, when the fiber is thus twisted and pressed for several months in the bale, there is an increased loss in waste when it is passed through the machinery at the mill.

Proper baling of fibers.—In one of his letters to the writer Prof. Lyster H. Dewey, botanist in charge of fiber investigations, United States Department of Agriculture, mentions some very valuable suggestions as to the proper method of baling fibers. These suggestions express not only Professor Dewey's expert opinion on the subject, but also that of some of the leading cordage manufacturers, who buy a large quantity of our fibers. For this reason I shall quote below that part of Professor Dewey's letter which deals with the subject of baling maguey and abacá, hoping that all our fiber producers and buyers will follow his instructions and save much time and expense that they are so unnecessarily incurring:

I have not seen any of the bales of Manila maguey open, and do not know the exact method used in packing this fiber there (in the Philippines). In Yucatan the common method is to take a bundle of fiber from the drying racks, where it is hung over galvanized wire, and twist this about one-half turn at the center where it hangs over the wire. These bundles, about 3 or 4 inches in diameter, are placed in the bale with the bent and twisted heads forming the ends of the bale. When pressed down for several months in the bale the fibers become bent, and there is an increased loss due to this cause when the bales are opened and the fiber is started through the machinery at the mill. I have talked with mill men about it, and they state that while they have to take the fiber as it comes to them they realize that there would be a decreased loss if the fiber could be baled nearly straight, or, if too long for the bale, merely bent over at the small end instead of at the middle. I would suggest that the fiber be made up into bundles about 4 inches in diameter, with the butts all one way, and tied near the butt with a few strands of fiber. This tying should be merely enough to hold the bundle together, and of such character that there would be little loss in cutting the strands and throwing them away at the mill. These bundles should then be placed in the bale in layers with the butts of one layer alternating with those of the next. The ends of the bale would therefore be made up of the butts of the fiber instead of the bent centers. Where the fiber is too long for the bale it may be bent over toward the smaller end without much danger of loss.

Some improvements could be made along similar lines in baling abacá. I was in one of the mills in New York City where they use large quantities of abacá, and they were opening some of the quilots, which is generally regarded as one of the highest grades of abacá coming to our markets. This fiber, as you are doubtless aware, is braided or tied in little knots at the ends and this is one of the marks by which it is easily recognized. The manufacturers, however, would be very glad to have some other mark, because it costs at least 75 cents per bale to cut off these little knots which are thrown away, making a waste of several pounds of fiber for each bale. It must require a large amount of time on the part of the fiber cleaners to tie up the fiber in this manner. It would be a great advantage to the manufacturer if it could be merely tied around the butt with a few strands of fiber, as suggested for the Manila maguey.

AGRICULTURE ALONG THE PHILIPPINE RAILWAY, PANAY.

By W. A. MACE, *Agricultural Inspector.*

The Philippine Railway in Panay stretches over about 73 miles of land between the towns of Iloilo and Capiz. It runs through eight towns and passes close enough to eight others to be used by their inhabitants as a means of transportation. The sixteen towns have a total population of 220,731 people, more than one-half of whom were shut off from the outside world previous to the building of the railroad through this district.

Agriculture naturally could not progress in the interior towns under the former conditions. In these towns there were just enough agricultural products for home consumption and an occasional small surplus which had to be taken to market by cargadores. The building of the railroad through here marked a great change in agricultural development. However, there are opportunities for far greater improvement and for far greater agricultural development than has yet taken place. The country is progressing very slowly, with the exception of the town of Passi and its outlying districts, where several new haciendas are being operated and lands have been purchased for several others.

Taking 10 miles on each side of the railroad from Iloilo to Capiz we have an area of 374,400 hectares, of which about one-half is agricultural land and of which only about one-fourth is under cultivation. Agricultural lands are composed principally of rice and sugar land, which will produce good corn and many other agricultural crops. There are also some fair tobacco lands and large areas of grazing lands. The principal crops are rice, sugar cane, corn, tobacco, and mungos.

SOILS.

A light sandy loam soil to a light sandy soil prevails in the greater part of the district. The Holaweer, Tigan, and Panay are the three principal rivers. These with their many tributaries contain many small tracts of rich bottom lands of black

alluvial soil. In some of these river valleys where the rivers overflow there are deposits of sand which cover several hectares. These deposits are very poor in plant food and will grow nothing for a few years, but the land will in time be of great value as the sand is not very deep and will gradually disappear or be assimilated by the soil.

TOPOGRAPHY.

The topography of the district as a whole is more or less rolling. There is a chain of mountains between the towns of Iloilo and Capiz which serves as a boundary line between the two provinces. The railroad runs parallel with the mountains on the Iloilo end and crosses into Capiz Province about 69 kilometers from Iloilo. The most of the land on the western side of the road at the Iloilo end is rough and mountainous, while on the east side a great part of it slopes down to the coast. There are large areas of level lands in the towns of Jaro, Pototan, and Barotac Nuevo on the Iloilo end of the district and some in the towns of Dumarao and Dao on the Capiz end, but these at Capiz are not as large as those near Iloilo. Naturally, the lands near the coast are more level than those close to the mountains. There are several small river valleys in the district.

CLIMATE.

There is a slight variation in climate between the two ends of the district, the precipitation at Capiz being slightly greater than at Iloilo. According to the reports of the Weather Bureau from 1897 to 1906 Iloilo had a mean rainfall of 2,189 millimeters and Capiz 3,859. The rainy season comes a little earlier in Capiz than in Iloilo. June or July is generally the beginning of the rainy season and it usually lasts through October into November. The large rainfall in Capiz insures a better rice crop there than in Iloilo.

ANIMALS.

The carabao is the principal work animal. There are not more than one-fourth as many work animals in this district as there should be. The country has not recovered from the ravages of the revolution and of the great outbreak of rinderpest in 1902. There have been several small outbreaks since that time which have been detrimental to the country but which have done comparatively little material damage. The restocking of the district is gradually taking place, mostly by the importation of animals. There are a few carabaos raised here, but the animals used for breeding purposes are those which are used for

work and naturally could be of but little service for breeding; then, again, breeding is a side issue for the farmer. There are a few herds of cattle, raised mostly for meat. But few horses are seen. Hogs and goats are quite numerous, though sheep are rather rare.

FARM IMPLEMENTS.

Like most other parts of the Islands there is a great lack of improved farm implements. Most of those used are of a very crude and antique order, such as the old wooden plow, bamboo harrow, bolos, etc., as well as sharp-pointed sticks for tillage, the knives for harvesting rice, and the carabao sled and cart used for transportation.

There are some modern farm implements in the district, including a few disk plows, turning plows of the "Luzon" type, carts, and one sugar mill that is of a more modern make. This mill is on a hacienda in the Passi district and is one of the most up-to-date pieces of sugar machinery in the Philippine Islands.

PRINCIPAL CROPS.

Rice.—There are between 30,000 and 40,000 hectares of land planted to rice, producing an average of about 20 cavans¹ per hectare. Rice is grown in every municipality and in probably every barrio. The best sections for this crop, however, are around Pototan and Barotac Nuevo of Iloilo Province and Dao and Dumarao of Capiz Province. In point of production it ranks first in the district. There are a great number of kinds grown here, probably as many as 60. The lowland varieties are more popular than the highland. Those most commonly grown are Macan and Penile, each of which has its lowland and upland varieties; these are beardless and have a stalk of medium height; the hull is straw colored and the grain is reddish and about one-third of an inch in length. A variety of rice may have one name in one section of the district but will be known by a different name in some other section. In most rice fields there is a mixture of a great number of kinds. Probably if it were not for the fact that some varieties mature earlier than others and would thus cause great loss in harvesting them at one time, all the different varieties of the district would be found in one field. One great trouble with the planters here as in all parts of the Philippine Islands is that they pay no attention whatever to the selection of seed. They are continuously trying to get a new variety of rice to replace the old which

¹ 1 cavan=75 liters.

has deteriorated from lack of seed selection. In some cases they obtain a new kind which gives excellent results at first and is satisfactory in every way. This variety very soon deteriorates and the planter begins to look around for some other sort. In some cases the land is not well prepared before planting, and this causes a gradual deterioration of the kind used, which can be easily detected after several generations. Rice is close fertilized, therefore a new variety is not obtained when two kinds are planted together. One could go into any field in the district and begin on the selection of seed and proper preparation of land before planting and in a few generations he would have a much better variety of rice than could be gotten from any other part of the country. The kinds being cultivated in these fields at present are adapted to the climate and soil, while an imported rice has to become acclimated and adapted to soil conditions, necessarily requiring the work of several generations.

The cultivation of rice is the same as in other parts of the Islands. For lowland rice small areas are cleared off for seed beds, and well broken up by plowing several times in different directions. The seed is then sown broadcast at a very high rate of seeding and plowed in. If there is not sufficient rain at the time of sowing, the planter waters his seedbed to insure germination. When the plants are about 30 centimeters in height they are transplanted to the field, which has been broken by being plowed and harrowed several times, covered with water, and stirred up well until it is of a mortar-like consistency. After transplanting they are left alone until harvest time.

The planting of upland varieties is different. The field is cleared off, broken up, and the rice is planted in rows which are generally about 2 feet apart; from four to ten grains are dropped in hills about a foot apart. The rice planted in this way requires some cultivation. The planter sometimes does this by plowing, or by stirring the soil with a bolo or sharp stick. The harvesting of the two kinds of rice is practically the same—by hand with knives made for the purpose.

The rice is stacked in the field or more often around the houses of the owners. In this district there is no threshing machinery. The rice is generally put on a scaffold made of bamboo and is cleaned by the men and women tramping on it with their feet, the grain falling to the ground through the cracks; the straw remains and is cast aside from the scaffold.

There is one large rice mill in Pototan and several others in Iloilo. The rice which is used for home consumption, however,

is hulled by the pestle and mortar or by small hand mills. The rice-mill companies buy what rice is to be sold, run it through the mills, and sell it back to the farmers later.

Sugar cane.—While sugar cane could be grown successfully in all parts of the district and is grown quite extensively in the towns of Jaro, Santa Bárbara, Barotac Nuevo, Dingle, and Passi on the Iloilo end, on the Capiz end there is very little planted. There are about 4,000 hectares planted to sugar cane in these five towns. In the remaining towns there is a total of some 500 hectares in this crop. The average production of sugar is 30 or 35 piculs¹ per hectare. The native variety of purple cane is the only one grown in the district. The growing season is twelve to thirteen months. Planting is done in December, January, and February, though some is planted as late as April. Cane planted in November or December gives a much better production than that planted later. The preparation and cultivation of the land is done with plows of the Luzon or Vargas type. The rate of seeding is high and the cultivation is not thorough enough.

The cane is cleaned, topped, and cut down with bolos, and hauled to the mills by carts. The mills of the district are all of the three-roller type with the exception of one in the Passi section, owned by Messrs. Miller and Evans, which has two crushers attached. The open-kettle system is used for evaporation, power being furnished by either 6 or 8 horsepower steam engines, mostly the former. Even with the crusher, which assists in the extraction of a much greater percentage of the juice, a great part of the juice is left in the bagasse. The sugar is cooled, put in bayones, which hold about one-half a picul each, and sent to market in these. The price varies from about ₱4 to ₱5 per picul for the low grades to about ₱7 or ₱8 per picul for the best.

Corn.—Corn is not very extensively grown in this district, though some is planted each year in every town. The total area planted in corn annually is probably about 1,000 or 1,500 hectares, the average yield being about 15 cavans per hectare. Some Mexican June is grown, but the native varieties predominate. For the most part it is planted on hillsides where irrigation is impracticable, and in some cases a crop is put in on the palay land before the rice-planting season. While three crops could be grown annually there is seldom any attempt made to grow more than one. The month of May is the best time for planting. Some of the planters sow the seed in November, though it is

¹ 1 picul=63.25 kilos.

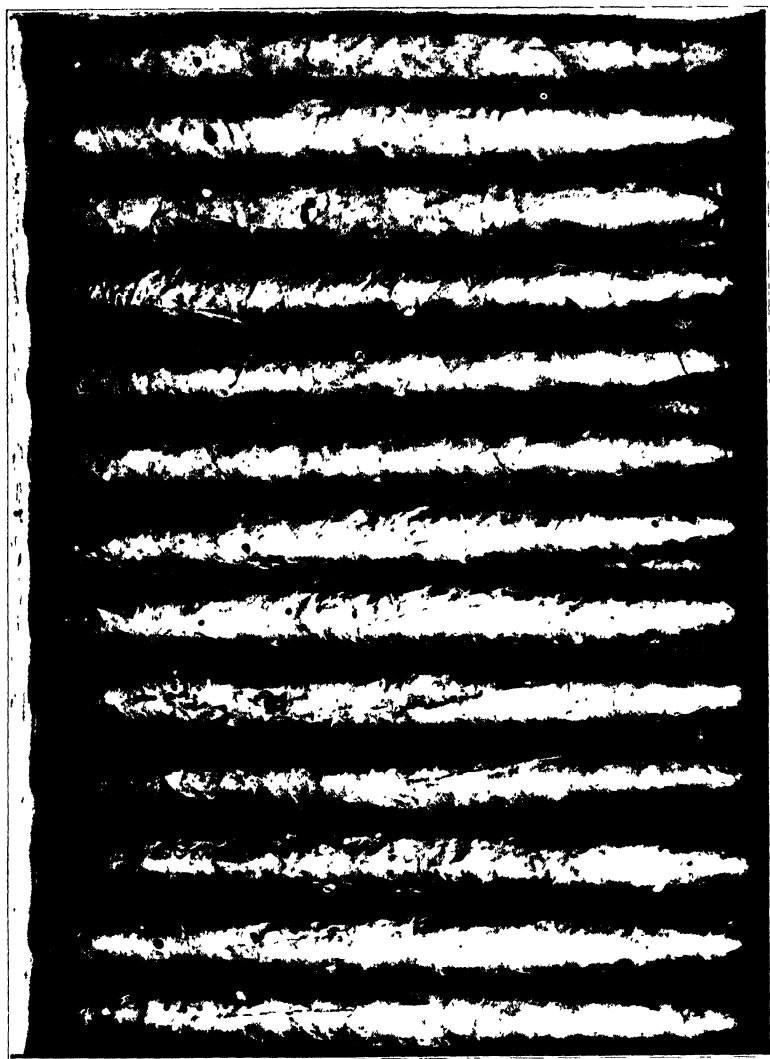


PLATE V.—CIGARS ATTACKED BY TOBACCO BEETLE

claimed that the corn does not give as good results as that planted in the former month.

The method of planting and its results are not very good; the rate of seeding is too high, the plants are crowded in the field, and there is too much stalk and very little grain. Furrows are opened from three-fourths of a meter to a meter apart and the corn is planted in these. A woman or child, sometimes a man, walks along the furrow and drops the corn, from three to seven grains at a time, about 40 to 45 centimeters apart, and covers it by pushing some soil over the grains with the feet. The cultivation is very poor, consisting of plowing two or three times with the crude plows and possibly cutting the weeds out with the bolo. The planters of the hillsides are generally very poor and have no carabaos. They prepare the land with bolos and sharp-pointed sticks, and the cultivation is done with the same implements. The seed is dropped in holes made by sharp-pointed sticks.

A great part of the corn is harvested as soon as it reaches the milk stage and taken to the market or consumed at home. That which matures is taken to the house of the planter as soon as it reaches maturity and is husked and shelled. Very little of the matured corn is put on the market, and sometimes only enough for seeding purposes is allowed to mature. This matured corn is sometimes substituted for rice or mixed with rice when the rice supply runs low. It is put in a mortar and broken up into fine particles. The soft parts of the grain—the embryo, etc.—are beaten into a very fine powder (corn meal) during this process. This meal could be used for making bread and is the most relishable part of the grain, but it is thrown away together with the skin, testa, and membrane. The endosperm is the only part of the grain used for food. This is broken into particles varying in size from 1 to 2 millimeters in diameter and is called "arroz de maíz." This is mixed with rice and cooked in the same manner as rice, by simply boiling in water. The people do not like it as well, and eat it only when they can not afford the luxury of rice. In some of the mountainous sections corn is the principal article of food and rice is a luxury.

Tobacco.—The tobacco lands of this district could hardly be considered as first class. Tobacco is grown quite extensively in the towns of Passi and Janiway, and the towns of Jaro, Dingle, and Cabatuan produce small quantities for market; though grown in several of the other towns it is used there for home consumption. There are about 1,000 hectares of land planted

in tobacco in this district. Only high, well-drained land with deep rich soil is used. The seeds are first sown broadcast on a small piece of very rich soil, where they are allowed to germinate and grow to 10 or 15 centimeters in height, then they are transplanted to the field. The preparation of the seed bed is a very important factor in tobacco growing. The bed is prepared by working the soil until it is thoroughly pulverized. All clods, rocks, and rubbish are carefully removed. A fence is built around the bed for protection from animals, and a shelter made of cogon or tigbao grass is placed over the bed to protect it from the direct rays of the sun and the heavy rains. The seeds are put in and covered by merely pressing the soil down with the smooth surface of a board.

The field is prepared and furrows are run from three-fourths of a meter to a meter apart, and then the plants are set in these rows, generally by making a hole in the soil with a sharp-pointed stick, inserting the roots, and pressing the soil down around them. They are transplanted in the afternoon, and if the soil is not moist enough it is watered. The plants are shaded with pieces of banana leaves for one or two days, or until the roots are well fixed in the new soil.

The cultivation of the plant consists of two or three plowings, frequent stirring of the soil, and cutting out weeds and grass with the bolo. Caring for the tobacco plant during the growing season is quite a factor. There are different kinds of insects which eat the leaves; these must be picked off as fast as they appear. When the plant begins to reach maturity it has to be topped, after which suckers grow out above each leaf, and to keep these from using up the food which is needed for the leaves they must be picked off as fast as they appear. From ten to sixteen leaves are left after topping, the number varying according to the fertility of the soil. Where the soil is very fertile there must be a greater number of leaves, as if but few are left they will take a long time to ripen and will not cure well. If too many leaves are left on the stalk they will not fill out, but ripen as very narrow and thin leaves. There is very little first-grade tobacco produced in the district, the greater part being much inferior to that grown in the Cagayan Valley. The Tabacalera Company has representatives stationed throughout the district for the purpose of buying all tobacco not used for home consumption.

There is an appropriation of ₱1,000 set aside by the Insular Government for the awarding of prizes to the tobacco growers of the Province of Iloilo. This is done to encourage tobacco

planting. This year all of the contestants for these prizes came from this district.

Coconuts.—There are about 90,000 coconut trees in this district, the greater part of which are either bearing fruit or are being used for the production of tuba. Barotac Nuevo, Pototan, Jaro, Dingle, Dao, and Dumarao are the principal coconut-producing towns. The coconut does better near the coast than in the interior. As a general rule the trees are too close together and no system is used in planting. Trees which are used for tuba are not allowed to produce nuts. The tuba is collected and sold in the towns by carriers who make the trip from the groves to the towns every morning. In taking the tuba to the interior, they often cover a distance of from 20 to 30 kilometers. The copra is sun dried and taken to the Iloilo market.

There are vast areas of good coconut land lying idle in this district. Some planting is being done from time to time, but the matter of having to wait for six or eight years before they can realize on the investment keeps the poorer class from planting many trees.

Camotes.—Camotes are grown in great quantities in the mountainous parts of the district, and are found in most of the markets during the greater part of the year. They are planted in rows and cultivated by hoeing or by merely stirring the soil with the bolo. When the plants begin to reach the age of maturity the soil is thrown up around them from the middle of the row, leaving a deep water furrow. The camote is harvested and generally cooked by boiling in water and then it is put on the market as cooked camotes.

Mungos.—This is a very valuable crop, though it is given but little attention in this district. They are grown quite extensively in the town of Jaro, but in other parts are found only in very few small patches. Imported mungos are for sale in the markets throughout the district. They can be grown very successfully but the planters seem to think that other crops are much more profitable.

Miscellaneous crops.—Besides the above-mentioned crops, small areas of cacao, coffee, abacá, and bananas are grown in the mountainous parts of some of the towns. The greater portion of the produce from these crops is used for home consumption, though some appears in the markets of Jaro and Santa Barbara.

The town of Cabatuan produces quite a bit of tree cotton, "dol-dol," used for making pillows. This is sent to the markets of Santa Barbara and Jaro.

Among the many different kinds of vegetables grown in the district the eggplant easily takes first place. This is cultivated everywhere, and is a dish much relished by the people.

IRRIGATION.

There is scarcely any advantage taken of the opportunities for irrigation afforded by the different streams. The land in Pototan, Santa Barbara, and Jaro is very level and could be irrigated by the Tigan River. The Bureau of Lands is at present having a cadastral survey made of the section. The Bureau of Public Works also has a man here investigating the possibilities for irrigation.

TRANSPORTATION.

Besides the transportation facilities furnished by the railroad, there are several Government roads in the district, as follows: One from Iloilo to Santa Barbara, parallel with the railroad, macadamized; one, about 15 kilometers long, from Jaro to Leganes and Sariga, macadamized; one from Santa Barbara to Cabatuan, in fairly good condition; one from Janiway, on the west, running 16 kilometers to Pototan, which is on the railroad, and thence 8 kilometers to Barotac Nuevo on the east side, macadamized; one from the barrio of Calinog, on the west side, running 12 kilometers to Passi, which is on the railroad, and thence 6 kilometers to the barrio of San Enrique, on the east side, surfaced; one on the Capiz end beginning at the railroad station called Dumarao and running about 3 kilometers to the town of the same name, macadamized; one running parallel to the railroad from Capiz to Loctugan, about 10 kilometers in length, macadamized. A road is under construction from the barrio of Cuartero, on the railroad, to the town of Dumalag, about 6 kilometers in length; in addition various projects in both road and bridge construction are under way throughout the district. Besides these lines of communication two other roads are most urgently needed, one from Passi into the Asasig River Valley and one beginning at the Dueños station on the railroad and running up the Calinog River.

CURRENT NOTES—NOVEMBER.

A NEW CROP FOR THE PHILIPPINES.

Within the last few years large plantations of coca have been made in Java, Madura, and Ceylon, and it appears that this crop will quite likely run the same course that cinchona ran several decades ago. Both coca (*Erythroxylon coca*) and cinchona, the quinine tree, were originally native to the Andean region of South America, but practically all of the quinine of commerce is now produced from Java grown bark.

The trade in coca leaves and the alkaloid cocaine prepared from them has recently become a matter of considerable importance in the Far East, and the spread of the terrible cocaine habit will probably continue, in spite of the customs and internal-revenue authorities, for years to come.

Coca has already been introduced into the Philippines, and although it does not grow properly at sea level there is a good chance of its doing well above 1,000 meters. The shrub requires a considerable amount of moisture for its best growth but the high degree of cultivation requisite for some other crops is not a necessary feature.

Java and Madura are now exporting some 500 tons of baled leaves valued at about ₱150,000; a ton is worth about ₱300 in the Holland market. This quantity is very remarkable and compares well with the 1,000 tons of leaves exported from Peru. It is estimated that Bolivia produces some 5,000 tons of leaves annually, almost all of which is consumed in the country. When it is considered that only a handful or two of leaves are required to produce intoxication, the effect of this amount of stimulating and injurious material in a country is truly startling. Aside from the rather favorable commercial aspect of the question, then, the matter should be considered carefully before any encouragement should be given to the coca industry of the Philippines.

NEW PLANTS FOR THE PHILIPPINES.

Mr. M. M. Saleeby, fiber expert of the Bureau of Agriculture, returned August 25 after ten weeks absence from the Philippines,

during which he went of Java to represent the Philippines at the International Fiber Congress held in Surabaya. On his return Mr. Saleeby brought with him a collection of seeds and plants of more than 250 species, obtained in Java and Singapore, probably the largest single plant introduction that hitherto has been made into the Philippines. Among these are several fruits that are new to the Archipelago or of which there are only a few trees extant: The rambutan (*Nephelium lappaceum*), pulasan (*Nephelium mutabile*), rambai (*Boccaurea motleyana*), kundangan (*Bouea macrophylla*), *Artocarpus rigida*, salak (*Zalacca edulis*), durian (*Durio zibethinus*), mangosteen (*Garcinia mangostana*), downy myrtle (*Rhodomyrtus edulis*), *Mangifera kemanga*, *Eugenia* sp., *Spondias lutea*, roselle (*Hibiscus sabdariffa*), *Malpighia glabra*, *Chrysophyllum cainito*, and several varieties of guavas and papayas. Several species of fiber plants new to the Philippines were included in this collection, the most important of which is perhaps the Panama hat palm (*Carludovica palmata*), the leaves of which are utilized in making Panama hats. There is a plant of this species growing at the Lamao experiment station and one in the nursery of the Luzon Floral Company, Manila, the growth of which augurs well for the future of this plant in the Philippines.

The Philippine mangos are famous the world over for their excellent quality, but they are also deplorably unproductive. This is due partly to insect enemies, and partly to lack of proper care of the trees, but in the majority of cases it is probably owing to the fact that all mango trees are seedlings. The increasing number of inquiries relative to the mango and its cultivation received by the Bureau has made it necessary to make an investigation of this fruit, and an agreement has been entered into with Messrs. Macondray & Co., Manila, by which the Bureau has begun experiments in top-working large mango trees and in fertilizer tests at Messrs. Macondrays' large estate, Muntinlupa, Rizal, and also at the Alabang stock farm. There are thousands of very large mango trees scattered throughout the Archipelago of which a large percentage yield little or no fruit, and if the results of the experiments come up to the expectations, it is safe to say that the mango crop can be quadrupled without adding to the number of trees planted, and with the operating expenses but slightly increased. Successful top-working of the old mango trees will also mean that the mango season can soon be very materially prolonged by the introduction of the very early and the very late varieties from India.

COPRA PRICES.

It may be of interest to the Philippine copra producer to know that at present Saigon copra is worth ₱2.50 less per ton than the Manila article; the "Java sun-dried" is worth only about ₱5 per ton more than Manila, while "Ceylon sun-dried" (a considerable part of which may be *artificially* dried) is worth ₱30 per ton more than our home article. Artificial and oven-dried copra, free from both smoke and sand, would probably be worth from ₱1 to ₱5 per picul more than the best Ceylon sun-dried. Putting the price of the latter article at 65 francs per 100 kilos (the market quotation for August at Marseille) or, in Philippine figures, about ₱16 per picul, and reckoning the probable price of the standard machine-dried copra at ₱17 (which is a very conservative basis), we find that the Philippine copra merchants are losing about ₱2.50 to ₱5 per picul by shipping smoky and imperfectly dried copra. This amounts to a loss of ₱5,000,000 to ₱10,000,000 per year.

Were all the copra producers in the Philippines supplied with artificial driers to-day, the Philippines would not only lead the world in quantity, but the other countries would *have* to fall into line or practically go out of business for the simple reason that the demand for artificially dried copra is very much greater than that for the crude-process article; and should all the Philippine product be thrown into the high-grade class, ordinary copra would take a decided slump.

"NEW IDEAS" IN PAPAYA CULTURE.

In the Queensland Agricultural Journal for May, 1911, there appears a very remarkable article on paw-paw culture in the Philippines, by Mr. Jesse, of Jolo, quoted from the Mindanao Herald. It would appear from this article that Mr. Jesse has several ideas concerning the culture of the "Javan" papaya which are apparently very original at least, not to say ingenious, and it is safe to state that his methods are not in general practice in the Philippines, nor in any other country. Among the more bizarre directions given by Mr. Jesse for his special culture method, it seems that "15 drops of tincture of iron" should be mixed with bone ash and applied to the soil in the boxes wherein the plants are to be propagated; a second dose of tincture of iron is applied to the plant at the time of transplanting, and the most interesting item of all is the "forced nourishment stage," for which period detailed instructions are given for supplying the growing plant with a solution of sugar from a bottle—a

quart of this liquid being "absorbed" by the tree in twenty-four hours through red rubber tubing connecting the bottle with the interior of the stem. This reminds one of the famous hoax which went the rounds several years ago, by which it was purported that squashes could be fattened (sic) by feeding them on milk from a bottle connected with the stem by a tube, or even by a string.

THE COMING BOOM IN COCONUTS.

According to the *Tropical Life*, there seems no difference of opinion as to our being on the eve of an active coconut boom. Coconuts certainly offer a very favorable opportunity for investment, since there is an insatiable demand for the oil, and, given favorable circumstances, the prices obtainable either for copra or oil, even if the area is considerably increased, will leave a substantial margin of profit, since the cost of lands suitable for coconut planting is low; that is to say, the prime cost, apart from promoters and boom profits, should be low, and, on the conservative basis of 48 trees to the acre and 40 nuts to the tree, 2,000,000 nuts in round figures can be looked for from each 1,000 acres cultivated. It seems that now it is to be coconuts that will occupy the attention of investors, next, perhaps, soybeans, groundnuts, etc.; last, but not least, when the public want a "sure thing" without 300 per cent dividend, we shall have cacao.

REGULATIONS FOR DEALING IN COPRA IN SAMOA.

From the *Deutsches Kolonialblatt* it appears that under the date of January 18, 1911, the governor of Samoa has promulgated certain regulations covering dealing in copra in those Islands. In accordance with these regulations unripe nuts or nuts picked from the tree can not be used, the copra having to be made exclusively from dead-ripe nuts which have fallen to the ground. All copra dealers, whether acting as agents or dealing on their own account, must obtain from the governor a permit which is personal, not transferable, and which may be canceled by the governor in case of noncompliance with the regulations.

A NEW COCONUT PEST.

A new pest of the coconut has appeared in Ceylon and the Malay States. This is a moth of the family *Zygænidæ*. The softbodied, sluggish caterpillar devours the tender portion of the leaves, leaving only the large veins, or midribs. Measures should be taken to prevent the introduction of this pest in the Philippines, or, if it has already been introduced, to immediately exterminate it.

MONTHLY VETERINARY REPORTS—SEPTEMBER AND OCTOBER.

Albay and Ambos Camarines.—On September 7, Mr. B. C. Ray left Manila for the purpose of investigating reports of surra and rinderpest received from the Provinces of Albay and Ambos Camarines. No rinderpest has been discovered in these provinces since his arrival there, but four municipalities have been found to be infected with surra.

Bataan.—In this province the infection is much more widely disseminated than during the preceding month. The municipalities of Balanga, Hermosa, Orani, Orion, and Pilar are now infected.

Bulacan and Pampanga.—In these provinces no material changes have taken place during the past month.

Cagayan and Isabela.—Dr. R. O. Porter, who sailed for Aparri on September 7, found upon his arrival there that rinderpest infection was not nearly so widely disseminated as was thought. In the Province of Cagayan the municipalities of Amulung and Tuguegarao are infected with rinderpest. Aparri and Enrile are infected with surra. The municipalities of Echague, Santiago, and Tagle, of Isabela Province, are infected with rinderpest.

Cebu.—The situation has remained unchanged during the past month. With the completion of the Siquijor campaign, it has been possible to occupy Cebu with a more adequate veterinary organization.

La Laguna and Rizal.—During the past month no cases of rinderpest have been discovered in either of these provinces, and it is possible that in this district the disease has been completely eradicated. However, the force of inspectors employed in these provinces has been small, and it will not be surprising if a few cases are again discovered.

Leyte.—This Island can not be considered entirely free from rinderpest, although no cases have been discovered for several days. Three municipalities of the province are infected with surra.

Oriental Negros.—Rinderpest has been eradicated in the Is-

land of Siquijor, and a large civilian force is now employed in the extermination of the disease in the mainland of Oriental Negros where three municipalities are now infected, viz, Bais, Dauin, and Tanjay. The completion of the work in Siquijor was hastened by the valuable assistance rendered by the military authorities who furnished Scout troops as quarantine guards.

Pangasinan.—The campaign which was started in this province several months ago has progressed very satisfactorily. There are now only three infected municipalities in the province. As stated in former reports, the military authorities deserve a great deal of credit for the success of the work. The forces are now concentrated in the western part of the province, and as soon as rinderpest has been eradicated from this section the forces will be moved southward into the Province of Tarlac with the idea of taking up a campaign similar to the one which has been carried on in the Province of Pangasinan and gradually exterminating rinderpest on the Island of Luzon by a progressive move southward.

Tarlac.—Little has been done in the eradication of disease in this province during the past month. The forces are engaged principally in locating the centers of infection in order that as much information as possible may be had upon the arrival of the forces which are now working in western Pangasinan.

Zambales.—During the past month rinderpest has been eradicated from San Narciso. Though infection still exists in the remainder of the municipalities which were infected a month ago, there have been very few cases in San Antonio, San Felipe, and San Marcelino.

MONTHLY CROP CONDITIONS—AUGUST AND SEPTEMBER.

ABACA.

Albay.—The condition of the growing crop is fair with an average amount of production. No damage by the storms.

Ambos Camarines.—Considerable planting is going on and large amounts are being harvested and placed on the market. Present price is 15 centavos per kilo.

Cebu.—The condition of the growing plants is good; some new areas have been planted, and considerable harvesting done; price ranges from 12 to 21 centavos per kilo.

Leyte.—The abacá growers are becoming somewhat disheartened on account of the low prices; practically no new planting is being done as well as very little harvesting. The price oscillates between ₱6.75 and ₱11.50 for 63 kilos.

Oriental Negros.—Prices have had a slight advance since the previous reports; present quotation ₱7.65 for 63 kilos.

Samar.—Considerable amount of fiber is being produced and placed on the market immediately.

Surigao.—Fine white abacá is bringing from ₱11.50 to ₱12 for 63 kilos. The coarse and colored fiber is sold at from ₱7 to ₱9.

COCONUTS.

Albay.—The general condition is very satisfactory with considerable harvesting being done. No damage to the trees has been done by the storm. Present price of copra is 15½ centavos per kilo.

Ambos Camarines.—It is estimated that some 400 hectares have recently been planted. The production of copra is going on continuously at a price of 10 centavos per kilo.

Bohol.—Planting goes on throughout the twelve months of the year. There has been some damage from the drought. The usual amount is being harvested at a price of from 14 to 16 centavos per kilo.

Capiz.—Some work is being done in the cleaning and harvesting of recently planted trees. There has been no damage from any source whatever, and the condition of the trees is generally fair. The price for the two months has ranged between 11 and 14 centavos per kilo.

La Laguna.—A larger amount has been harvested during the two months than in the previous months of the year. Copra has been quoted at from ₱9 to ₱11 per 63 kilos.

Leyte.—Considerable attention is being paid to this crop by the farmers. No damage has been done to the trees by storm or by insects.

Pangasinan.—Some little planting of new land and harvesting from the old trees has been going on during the two months.

Samar.—Considerable production has been going on in the southern part of the island at a price of 11 centavos per kilo.

Tababas.—The present harvest will equal that for the same months in previous years, though the results of the continuous drought are still felt.

CORN.

Bohol.—The ordinary amount will be harvested though the crop has suffered somewhat from the drought. Present price of the grain is 7 centavos per liter.

Cagayán.—Two crops are planted each year, in January and May. The May planting was almost entirely destroyed by storm and excessive rainfalls; however, if the weather conditions change another crop will be put in in the month of October, in order to compensate for the loss of the earlier crops.

Cebu.—The general condition of this crop is very good, a large number of hectares having been planted and considerable harvesting having been done. The shelled corn brings from 3 to 5 centavos per kilo.

Ilocos Norte.—Considerable damage was done to the growing crop by the July typhoon. The present price is ₱3 for 46 kilos.

Isabela.—The usual amount has been planted though the growing crop was so seriously attacked by worms that it is estimated that only one-third of the usual harvest will be gathered. Present price of the grain 10 centavos per liter.

Leyte.—Some planting has been done, but on a very small scale. Owing to the exportation of that harvested, the price has reached a high figure. A considerable shortage in this crop is feared.

Occidental Negros.—Very little corn is under cultivation and practically none of this product is seen on the market.

Oriental Negros.—A fair harvest of this crop is being gathered though it hardly satisfies the local demand. Shelled corn brings 6 centavos per liter.

Samar.—In some sections harvesting is still going on though to rather a small extent.

RICE.

Bulacan.—A large area has been planted to this crop though in some places there has been considerable damage by worms. The price of clean rice, first class, is ₱8.50 per 75 liters; second class ₱7.90.

Capiz.—More rice has been planted in this province than for many previous years, but the crop is now suffering from lack of rain as very little has fallen during July and August. If the drought continues the rice crop of Capiz will suffer to a very considerable extent.

Ilocos Norte.—A large area has been planted but at the beginning of August practically all the lowlands were flooded by the heavy rains and large areas were damaged by the strong winds.

Iloilo.—In the southern part of Iloilo Province the rice is all planted and some of it is nearly ready to harvest. In other parts of the province there has been abundant rain. A great deal of rice has been planted during August, and planting still continues.

La Unión.—At the time of the recent typhoon the people had planted their seed rice and had commenced to transplant. The storm damaged the rice whether in the seed bed or transplanted. Last year's palay in storage was also damaged.

Nueva Ecija.—The prospects for a banner crop of rice are favorable, and the acreage under cultivation is increasing. The several typhoons did little damage in the province.

Occidental Negros.—All that has been done during the past month in the southern part of this province has been the transplanting of rice and the preparation of rice land. From Bacolod south to Hinigaran there does not appear to be any very large tracts of land being planted to rice, except in the municipality of Valladolid. As there has been an abundance of rain the rice that is growing is in very good condition.

Pangasinan.—In the towns in the center and southern parts of the province the crop suffered somewhat from excessive rain-falls and floods. Some damage has been done by insects. The condition of the highland planting is excellent and that of the lowland planting poor.

Rizal.—The Manajan and San Pedro Hacienda, about 10 miles beyond Montalban, has over 1,000 hectares of upland rice ready to harvest; the yield is very heavy.

Tarlac.—Present condition of the growing crop is good and no damage has been caused by storms or insects.

Tayabas.—Owing to the long-continued droughts a lesser

amount will be harvested this year than is usual, though good reports are coming in from Calauag, Lopez, Gumacá, and Atimonan, where the usual harvest is looked for.

SUGAR CANE.

Batangas.—In the latter part of July this crop suffered considerable damage from the winds. During August it seemed to recover from this set-back, and now bids fair to give an ordinary, at least, if not excellent harvest. Sugar is worth ₱6 for 63 kilos.

Bulacan.—Throughout August and September considerable damage was done to the growing cane by rats. Sixty-three kilos of sugar, first class, is worth ₱9.50; second class, ₱8.50.

Ilocos Norte.—The continual drought up to the middle of July and the floods since the beginning of August will undoubtedly cause the loss of the greater part of this crop.

Iloilo.—The coming sugar-cane crop in Iloilo Province has been greatly damaged by excessive rainfall. Much of the cane is now standing in mud and is turning yellow, and none of it is getting enough sunshine to make a good growth. The only cane that looks well is that which is growing on sandy soil.

Occidental Negros.—The rainfall has been so heavy during the past month that the planters have had but very little opportunity to cultivate their sugar cane, and as the result of both the rain and lack of cultivation the amount of sugar produced per hectare will be lower than it would have been under more favorable conditions, especially in the southern part of the province.

Tárlac.—General condition of the standing cane is good; the farmers are engaged at present in cultivation. No damage from storms or insects.

MARKET REPORTS—SEPTEMBER.

NOTES ON MANILA MARKETS FOR SEPTEMBER.

By KER & Co.

(Based on advices from New York, August 24; San Francisco, August 28; London, August 31; Hongkong, September 26; Iloilo, September 26, Cebu, September 26.)

SUGAR.

No business of importance has been done in Manila, Iloilo, and Cebu.

MANILA HEMP.

We quote United States current ₱8.75 and United Kingdom ₱7.75 per picul first cost f. o. b. Better grades quiet basis ₱15.75 good current. Receipts for the nine months at all ports were 951,497 bales, compared with 1,006,650 bales in 1910 and 956,258 bales in 1909 for the corresponding period.

COPRA.

Firm at ₱13 Cebu fair merchantable and ₱11.75 Manila fair merchantable, per picul first cost f. o. b. There are free arrivals and shipments generally which are likely to be heavy next month.

DISTRIBUTION OF PRINCIPAL PHILIPPINE EXPORTS FOR THE NINE MONTHS, JANUARY TO SEPTEMBER, 1911.

Products exported.	United States.	China.	Pacific coast.	Great Britain.	Continent of Europe.	Australia.	Japan.	Singapore.
Dry sugar (tons) -----	160,451	15,506	13,100	3,344				
Hemp (bales) -----	342,663	7,700	38,487	367,247	74,931	19,937	17,982	8,227
Copra (piculs) -----	32,960		138,400	53,600	1,037,784		1,517	
Cigars (thousands) -----	9,872	25,647	13,521	8,312	9,516	8,189	920	10,458

MANILA AND LONDON FIBER MARKET.

Receipts and shipments of Manila hemp.

[Telegram from Manila to London, October 7, 1911.]

	1911	1910
Hemp receipts at:	<i>Bales.</i>	<i>Bales.</i>
Manila since January 1	741, 788	776, 977
Cebu, etc., since January 1	209, 794	246, 782
All ports since January 1	951, 497	1, 022, 759
Shipments by steamer to:		
United Kingdom, cleared since January 1	807, 197	868, 907
Atlantic coast, United States, cleared since January 1	276, 258	869, 782
Pacific Coast, United States, cleared since January 1	110, 147	76, 929
Continental ports, cleared since January 1	71, 831	56, 946
Shipments to:		
All other ports	58, 080	
Local consumption since January 1	28, 920	
Loading steamer on the berth for:	77, 010	57, 949
United Kingdom, about		9, 000
Atlantic coast, United States, about	19, 000	16, 000
Pacific coast, United States, about	14, 000	7, 500
Continental ports, about		250
Shipments per sailer to Atlantic coast, United States, since January 1		20, 650

Bales of hemp loading for United States, by steamer:

City of Naples	8,000
Schuykill (Cebu)	11,000

Bales of hemp loading for Pacific coast, by steamer Kumeric 14,000

LONDON FIBER MARKET.

The following prices for Manila hemp, sisal, and maguey were quoted by Messrs. Landauer & Co., London, August 30, 1911.¹

Manila hemp.—Receipts for the week are cabled as 15,000 bales against 21,000 bales for the corresponding week last year.

Fine hemp has been offered, but very sparingly. A few trifling quantities have found buyers at steady rates.

Range of prices.

Grades.	Spot and close by.		
	Per ton.	Per ton.	Per picul.
Best marks	40/- to 43/-	£400.00 to £430.00	₱25.00 to ₱26.90
Good marks	38/- to 40/-	380.00 to 400.00	23.75 to 25.00
Good current	34/- to 34/6	340.00 to 343.00	21.25 to 21.43
25 per cent over current	22/- to 22/6	220.00 to 228.00	18.75 to 18.95
Fair current	20/- to 20/3	200.00 to 201.50	12.50 to 12.59
Superior seconds	19/6 to 19/9	193.00 to 194.50	12.10 to 12.16
Good seconds	19/3 to 19/6	191.50 to 193.00	11.97 to 12.10
Fair seconds	19/- to 19/3	190.00 to 191.50	11.85 to 11.97
Good brown	18/9 to 19/-	184.50 to 190.00	11.55 to 11.85
Fair brown	18/9 to 19/-	184.50 to 190.00	11.55 to 11.85

Sisal hemp.—The New York market is dull at 4½ cents equal to £21 10/- charges including freight Europe. Good quality in store obtainable at £21.

¹ These quotations are in pounds and shillings English currency per ton. One pound equals about 10 pesos Philippine currency. One ton equals approximately 16 piculs.

Manila maguey fiber.—This commodity to receive attention; a fair amount of business passing on the basis of £19 to £19 10/— No. 1 Cebu, £16 10/— ordinary No. 1, £15 No. 2, and £13 15/— No. 3.

ILOILO SUGAR MARKET.

The arrivals of sugar in Iloilo from the mills and sugar districts were 115,405 piculs in July, 91,525 piculs in August, and 51,440 piculs in September.

During the months of July and August there was a gradual and remarkable increase in price from 6 pesos and $\frac{1}{2}$ real¹ on July 1 to 8 pesos and $4\frac{1}{2}$ reales on September 14 when it dropped to 8 pesos and $3\frac{1}{2}$ reales, which price continued until September 18 there being no buyers and the price becoming nominal during the remainder of the month. This considerable rise in price of sugar is attributed to the great demand in the United States for this product, which is indicated by the large shipments made during the last three months.

July shipments.

[In piculs.]

Date.	Vessel.	Destination.	Superior.	Wet.
July 17	Ocean Prince	United States	89,600	
July 20	Aragonia	New York	34,400	
July 23	Kaifong	Hongkong via Manila	7,500	
July 27	Kabingoa	New York	56,000	
July 28	Bessie Dollar	San Francisco	7,600	
July 29	Suruga	New York	32,000	
Total for July			227,100	

August shipments.

[In piculs.]

Date.	Vessel.	Destination	Superior	Wet
Aug. 2	St. Ronald	New York	83,600	
Aug. 3	Zafiro	Hongkong	2,105	
Aug. 5	Reigate	United States	80,800	
Do.	Teau	Hongkong	1,963	
Aug. 7	Sildra	United States	64,000	
Aug. 12	Kaifong	Hongkong	720	
Do.	Incerclyde	New York	48,000	
Aug. 19	Taming	Hongkong via Manila	1,971	
Aug. 21	Karenga	United States	104,000	
Aug. 31	Dunedin	do	104,000	
Total for August			491,159	

¹ One real equals twelve and a half centavos.

September shipments.

[In piculs.]

Date.	Vessel.	Destination.	Superior.	Wet.
Sept. 1	Wray Castle	United States	95,200	
Sept. 2	Kalfong	Hongkong		986
Sept. 4	Indrasama	United States	105,600	
Sept. 6	Taming	Hongkong		562
Sept. 7	Indradeo	United States	52,000	
Sept. 13	St Michael	do	79,200	
Sept. 20	City of Naples	do	75,200	
Sept. 24	Schuykill	do	84,000	
Total for September			491,200	1,548

Exports up to September 24, 1911.

[In piculs.]

To—	1909-10 crop.		1910-11 crop.	
	Superior.	Wet.	Superior.	Wet.
United States	1,222,800		2,028,000	
China	74,197	486	156,071	2,903.50
Total	1,296,997	486	2,184,071	2,903.50

PRINCIPAL PHILIPPINE IMPORTS AND EXPORTS.

By the INSULAR COLLECTOR OF CUSTOMS.

AUGUST, 1911.

IMPORTS.

Articles.		Manila.	Cebu.	Iloilo.	Totals.
Rice.....	(Kilos.....	14,035,976	3,753,681	5,266,861	23,056,518
	(Value.....	\$495,468	\$132,706	\$176,670	\$804,844
Beef cattle.....	(Number.....	559			559
	(Value.....	\$14,460			\$14,460
Eggs.....	(Dozens.....	368,077	89	111	368,277
	(Value.....	\$26,396	\$10	\$12	\$26,418
Sugar.....	(Kilos.....	254,510	29,284	29,997	313,791
	(Value.....	\$18,323	\$2,351	\$2,119	\$22,793
Coffee.....	(Kilos.....	204,911	1,839	643	207,393
	(Value.....	\$60,376	\$347	\$190	\$61,113
Cacao.....	(Kilos.....	41,246			41,246
	(Value.....	\$9,457			\$9,457
Raw cotton.....	(Kilos.....	48,352			48,352
	(Value.....	\$15,962			\$15,962

EXPORTS.

Hemp.....	(Kilos.....	12,845,751	2,738,725		15,584,476
	(Value.....	\$1,306,349	\$286,247		\$1,592,596
Copra.....	(Kilos.....	3,746,944	3,100,183	201,656	7,048,788
	(Value.....	\$325,417	\$262,000	\$17,925	\$605,342
Sugar.....	(Kilos.....	10,591,193	2,545,632	33,396,039	46,532,864
	(Value.....	\$547,538	\$142,000	\$1,814,177	\$2,503,715
Cigars.....	(Thousand.....	13,809			13,809
	(Value.....	\$210,981			\$210,981
Cigarettes.....	(Thousand.....	2,658			2,658
	(Value.....	\$3,455			\$3,455
Tobacco.....	(Kilos.....	956,410			956,410
	(Value.....	\$132,299			\$132,299

TEMPERATURE AND RAINFALL FOR AGRICULTURAL DISTRICTS IN THE PHILIPPINES.

By the DIRECTOR OF THE WEATHER BUREAU.

AUGUST, 1911.

[Temperature and total rainfall for twenty-four hours beginning at 6 a. m. each day.]

Date.	Hemp.				Sugar, Iloilo.		Rice, Tarlac.		Tobacco.			
	Albay.		Tacloban.		Temperature.	Rainfall.	Temperature.	Rainfall.	Aparri.		San Fernando.*	
	Temperature.	Rainfall.	Temperature.	Rainfall.					Temperature.	Rainfall.	Temperature.	Rainfall.
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
1	27.5	0.8	28.6	0.8	27.1	1.8	25.8	28.8	28.5	123	183.1	
2	27	1	27.6		26.9	7.9	26.4	2.8	26.5	46	18.5	
3	27.8		28.5		26.9	20.8	27.7	8	27	10.7	25.6	
4	28.1		27.8	2	27.4		27.8		26.8	8.4	6.6	
5	28.2		28.8		27.7		28.6		27.6	.8		
6	28.3		28.8		27		28.1		28.4			
7	28		28.6		27.8	1	29.1		28.6			
8	27.6		28.1		27.2		28.4		27.9		1.5	
9	28.1		28.4		28	.5	27.9	5.6	27.6	.9	56.6	
10	28.5	.5	28.1	.5	28.8	21.8	29.2	2	26.4	16.5	2.8	
11	27.1	1.1	27.9		25.9	18.6	27	9.4	25.3	1.1	4.8	
12	27.5	1.5	28.2		24.8	22.1	28.1	.5	25.4	9.7	95.7	
13	27.4	1.3	27.9		25.2	34.9	26.6	12.9	26.3	8	78.5	
14	27.4	2	28.6		25.5	42.5	26.9	26.4	26.6	1.8	65.6	
15	27.6		28.1		25.8	.5	26.4	4.8	26.8	.8	19.1	
16	27.6		28.2		27.1		28.1		27.2		2	
17	27.9	2.8	27.1	3.3	26.8		27.4		26.6	40.1	36.1	
18	24	41.3	25	8.9	26.6	8	27	25.4	25.6	18	21.6	
19	25.4	5.3	26.6		26.2	.3	26.6	50.1	26.1	2.5	.6	
20	26	.5	26.9	2.8	26.3		26.5	7.8	26.1		16.3	
21	26.5	45.8	27.1	1.8	25.5	7.7	27		27.2		58.8	
22	25.9	18.5	26.7	8.1	26	5.1	27.4	3.8	27.9		13	
23	25.9	16.5	26.3		26.2	7.4	27.7		27.8			
24	25.3	.8	26.8		26	8.1	26.4		8.9	67.8	50.1	
25	26	5.9	28.6		27	10.9	26	10.2	26.6	141.3	74.6	
26	27.2		28.3		26	12.5	27.1	2.3	24.9	8.4	20.5	
27	27.4		28.4		26.1	7.6	27.8		27			
28	27.3				27.2		28.5	1.3	27.8		18.3	
29	27.7		28.2		27.5		27.8	1	27.9		55.4	
30	28.1		28.4		27.6		27	8.3	26.6	.5	8	
31	27.7		28.3	10.7	27.8	1.3	26.7	6.4	28.2	2.8	69.6	

* The temperatures of this station are missing owing to breakage of thermometer.

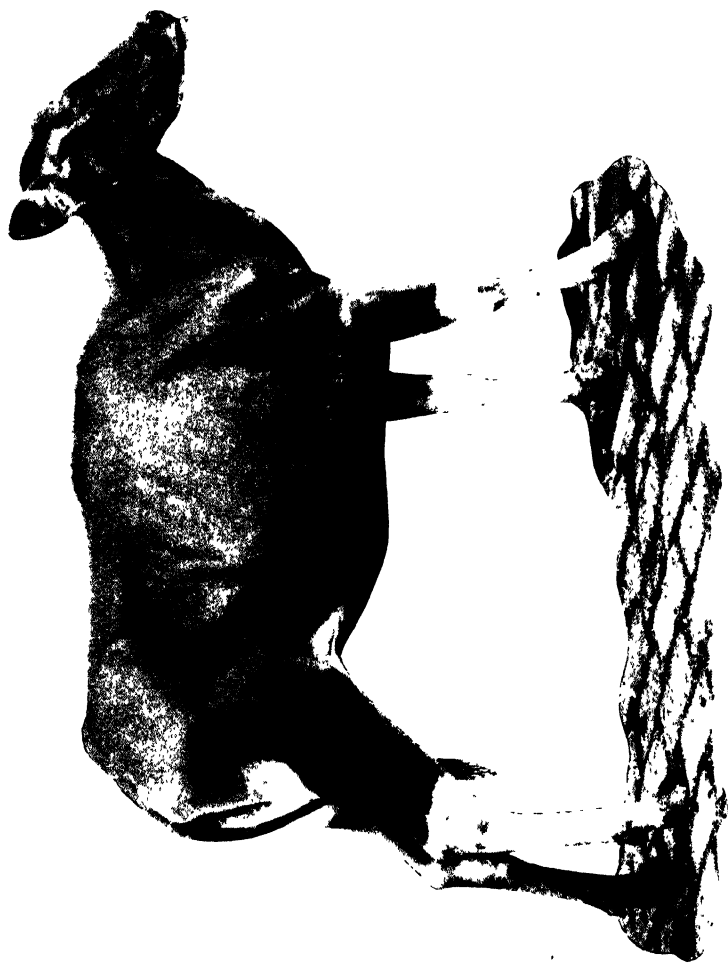


PLATE I.—TIVOR COW

(Probably *Bos latifrons*, note false dewlap 4 centimeters deep from brisket to navel.)

THE PHILIPPINE *Agricultural Review*

VOL. IV

DECEMBER, 1911

CONTENTS AND ILLUSTRATIONS

1911 OCT. 19

CONTENTS.

Editorial	641
Some Phases of the Problem of Importation of Cattle into the Philippines, by Archibald R. Ward, Chief Veterinarian	643
Warnings to Rubber Planters, by O. W. Barrett, Chief, Division of Experiment Stations	647
Another Mango Pest in the Philippines, by P. J. Wester, Horticulturist	649
A New Method of Controlling Termites, from notes furnished by D. B. Mackie, Agricultural Inspector	653
Rinderpest on Kabaruyan Island, from Report by Dr. Chas. H. Decker	656
Review of the Report of the Fiber Expert on Java and the Surabaya Fiber Congress, by R. J. Fiske, Agricultural Inspector	659
A Review of the Scope and Methods of Tropical Veterinary Entomology, by M. B. Mitzmain, Entomologist	666
Current Notes—December: Tobacco Seed Cleaning; A Loranthus Affecting Citrus Trees; Copra Driers; Mango Pests in Cavite and Rizal Provinces; Hat Making; Sericulture; Vanilla Growing; Apiculture; Pop corn	678
Monthly Veterinary Reports—October and November	684
Book Reviews, by O. W. Barrett: <i>Cacao</i> ; <i>Les Kolatiers et Les Noix De Kola</i>	686
Notes on Manila Markets for October	688
Principal Philippine Imports and Exports, for September	690
Temperature and Rainfall for Agricultural Districts in the Philippines, for September	691

ILLUSTRATIONS.

PLATE I. Timor Cow	Frontispiece.
II. Timor Cattle	Facing page—646
III. Mexican Fruit-fly (<i>Trypeta ludens</i> Loew)	652

TEXT FIGURE.

FIG. I. Pump, Fume Chest, etc., Used for Destroying Termites	Page. 655
--	-----------

EDITORIAL.

THE NEW DIRECTOR OF AGRICULTURE.

On October 16, 1911, Mr. F. W. Taylor, of Denver, Colorado, assumed the duties of Director of Agriculture.

Mr. Taylor was for some years, beginning in 1891, professor of horticulture at the University of Nebraska and at the same time in charge of all the university extension work—including

farmers' institutes—in that state. From 1897 until 1905 he was connected with the Omaha, Buffalo and St. Louis Expositions as chief of the agricultural and horticultural exhibits. These departments at St. Louis covered 26 acres (10.5 hectares) of floor space, more than one-fourth of the entire exhibit space in the exposition. Exhibits were maintained by all but two or three of the States and Territories of the Union and by forty-four foreign countries. In assembling the exhibits for these various expositions Mr. Taylor visited every State in the Union and also a number of foreign countries; in addition, he has traveled very widely in the investigation of agricultural conditions—with special reference to horticulture—in many countries, including Mexico and practically every part of Europe.

For the last five years Mr. Taylor has devoted all of his time to agricultural work in the arid regions of the West with particular reference to irrigation. Two projects, of which he has had the management, have spent several million dollars in irrigation construction, resulting in the reclamation of more than 200,000 acres (80,940 hectares) of land.

SOME PHASES OF THE PROBLEM OF IMPORTATION OF CATTLE INTO THE PHILIPPINES.

By ARCHIBALD R. WARD, *Chief Veterinarian.*

The possibility of importing cattle diseases with the effect of undoing the results of disease eradication in the Philippines is a danger that menaces all efforts to provide beef and draft cattle. The cattle importation business is largely carried on with the mainland of Asia and adjacent islands, together with Australia, on account of their proximity. The Sisiman stock-yards and matadero described in the October issue of the REVIEW seem to have disposed of the problem of arranging for an inexhaustible supply of beef cattle from Australia for the Manila market.

It is necessary, however, to look elsewhere for sources from which to supply the demand for draft animals and beef for slaughter in the provinces.

Indo-China has for years been the main source from which were drawn carabaos, and more recently, the main source of draft and beef cattle. In view of the existence of foot-and-mouth disease and rinderpest there, the importers have shown a remarkably good record in bringing in healthy cattle. Some months ago several shipments arrived infected with foot-and-mouth disease, and after the discovery of this, all importations ceased.

The great importance of this trade to the Philippines led this Bureau to send Dr. D. C. Kretzer to Indo-China for the purpose of arranging, if possible, different methods in handling animals so as to avoid their becoming infected.

Doctor Kretzer found that, in accordance with local regulations, all cattle were embarked at Pnum Penh, Cambodia. This place was found to be infected at the time of his visit, as it had been at the time of shipment of the last infected cargo imported from there. It had been the custom to gather cattle and carabaos in small groups in the interior and later to transport them to Pnum Penh for shipment. Enough of such cattle were congregated at various points to load several steamers,

but the existence of foot-and-mouth disease in Pnum Penh prevented the owners from taking them there for shipment where they would surely be exposed.

Cambodia is plentifully supplied with rivers navigable for cattle ships and nothing but the local regulations prevented the direct shipment of these animals from the interior without exposing them in the city of Pnum Penh. Doctor Kretzer took this matter up with the French authorities, pointed out the necessity of avoiding Pnum Penh, and succeeded in obtaining permission for direct shipment. He further arranged to have export animals gathered in the future upon several islands in the river above Pnum Penh which have grazing facilities sufficient to support 1,500 to 2,000 cattle for the time necessary to gather that number and await turn for shipment. The use of several islands prevents the concentration of more than one cargo of animals on one island, and thus, should diseased cattle be found in a herd, the infection would be restricted to one cargo. This arrangement offers the best conditions for bringing healthy animals from Indo-China and it is hoped that it will continue to work well, in view of the fact that the importation of carabaos from that country is a matter of vital interest in the agriculture of the Philippine Islands.

Cambodia has been, and probably will be, the chief source of animals imported into the Philippines from Indo-China. However, one dealer is considering the matter of exporting cattle from the port of Touraine in the protectorate of Annam, and has permission from the government to take out 5,000 head.

Hongkong, owing to its close proximity to Manila and good transportation facilities, has been the chief port along the China coast from which cattle were exported to the Philippines. The condition of shipments from this port was indescribably bad during the time the trade was permitted. Data are herewith presented covering the last eighteen months of importation, July 5, 1909, to December 2, 1910, after which importation was in effect prohibited by requiring a three months' quarantine at Manila.

One hundred and seventy-three shipments were imported during this period of eighteen months. Of these, 110 shipments showed foot-and-mouth disease alone at inspection on shipboard; 5, rinderpest alone; 8, both rinderpest and foot-and-mouth disease; 26 shipments were designated "exposed" and were quarantined on lighters. The designation of such shipments as exposed was necessary to prevent the landing of the shipments in case no disease was detected during inspection. Otherwise, infected shipments might have escaped detection as there was no

authority for quarantine unless regarded by the Director of Agriculture as exposed. Many of these "exposed" shipments developed disease during the quarantine. After June 1, 1910, direct authority was available for quarantining shipments on lighters. Between this date and the practical prohibition of importations from Hongkong 24 shipments were imported, of which 22 were found free from disease after ten days' quarantine.

An investigation was recently made of conditions in Hongkong by Dr. P. H. Burnett. The following quotation from his report goes far toward explaining the reason for the excessive number of infected shipments received from that port:

Hongkong, in itself, is nothing more or less than what might be properly termed a "cattle exchange." As cattle are not produced in the colony, they must all be imported for slaughter and exportation.

The source of supply is mainly the interior of China, with a small percentage from French Indo-China. As to conditions at the different sources of supply, will say that they naturally vary, and in most cases are unknown to the Hongkong officials, which is of no importance, as there are no questions asked regarding the health conditions of animals in the localities from which they are shipped, nor the actual condition of the animals questioned before they are allowed to be unloaded in Hongkong.

The Government does not attempt to control the source of supply, nor even prohibit the entrance of animals from districts known to be infected with rinderpest or other contagious animal diseases. They have no stock-raising interests, and will give absolutely no guarantee that Hongkong will remain free from contagious animal diseases from one day to the next.

I was unable to gather reliable information, during my short stay, as to the prevalence of animal diseases in any certain section of the country, but as the Chinese Government has made no attempt to collect data, fight or control animal diseases, it is plausible to believe that conditions to-day are the same as they have been in past years.

The foregoing considerations lead the writer to conclude that Hongkong cannot be relied upon as a source of healthy cattle. As progress is made in eradicating foot-and-mouth disease and rinderpest in the Philippines the risk of incurring dangers from importation will become more and more inexcusable in the future.

It is necessary, however, to face the fact that the importation of draft and breeding animals should be restricted as little as possible. It is believed that such animals can be introduced with greatest safety when immunized in Hongkong by the method of simultaneous immunization applied by a veterinarian of the Bureau of Agriculture. The process, when applied to animals free from foot-and-mouth disease, need not be attended with such a death rate as to prevent the commercial success of importing such animals. The introduction of foot-and-mouth disease among animals being immunized by simultaneous im-

munization would be a disastrous accident. A consideration of the conditions attending the introduction of animals into Hong-kong leads one to conclude that the risk of the introduction of foot-and-mouth disease is a serious one. Attention is being given to the matter of affording opportunity for the importation of dairy and breeding stock from Hongkong after such immunization. It is to be hoped that the scheme will prove practicable, since every animal so imported will become a permanent asset to the agriculture of the Islands through its immunity against attack by rinderpest.

Importation of cattle and carabaos from Timor has been begun only recently. Dr. J. A. Thompson accompanied the first vessel proceeding to Timor for cargo for the purpose of gathering information for this Bureau about live-stock conditions in that territory. He did not find evidence of contagious animal diseases in the island. The carabaos of Timor are believed to be indigenous there and there is no record that any have ever been imported. Immense herds are maintained by native chieftains as an evidence of wealth, though there seems to be very little desire to sell, and it is estimated that about 2,000 carabaos could be available for exportation each year. They cost in Timor from ₱20 to ₱40 per head, depending upon the locality.

The original stock of cattle is said to have been imported from Java many years ago, but none have come from there during the last ten years. These animals (*Bos banteng*) are interesting in that they belong to a different species of cattle from those with which we are familiar in the Philippine Islands. They are more or less wild and are never broken to the plow.



PLATE II.—TIMOR CATTLE

(Probably nearly full-blood *Bactrian*, old bull in foreground, three cows and one bull in background)

WARNINGS TO RUBBER PLANTERS.

By O. W. BARRETT,

Chief, Division of Experiment Stations.

In the belief that no good can result from withholding bad news, and also that "being forewarned is being forearmed," we feel it is incumbent upon us to issue a warning to importers of Pará rubber stumps in regard to the possibility of introducing the "brown root rot" disease (*Hymenochæte noxia* Berk.) from the Malay States. What is believed to be this very fungus has recently made its appearance in at least one plantation in the Philippines and its virulence seems to be as great here as in the Malay States, since it kills the Pará trees coming in contact with it in apparently a very short space of time.

Judging from the circumstances it would appear that the fungus in the sole case coming under our notice was a strictly local or spontaneous affair, though we hesitate to state that this disease is really endemic here. It is more or less common in both Ceylon and Malaya and is probably causing considerable damage both in the Samoa rubber plantations and in West Africa. Fortunately it is a contact fungus; that is, it spreads from one root directly to another without traversing more than a very short space, if any, in the soil itself; if it should also produce spores on trees long dead from its attack, such spores might, of course, spread widely and cause very extensive damage if they found a congenial lodgment.

Any stump or seedling plant of Pará rubber coming into the Philippine Archipelago from Ceylon or Malaya giving the slightest indication of a grayish brown decaying area should be burned at once, and all plants in contact with it should be thoroughly disinfected. Either the taproot or the feeding roots may become first infected and in the nursery or seed bed the plants may show no symptoms of the disease until the crown becomes affected, at which time the plant begins to shed its leaves; within a week or so from the time of the cutting off and poisoning of the sap supply at the base of the trunk, the tree may be dead.

Another disease against which Pará importers should guard is the "dieback" (*Thyridaria tarda* Ban.); this is a wound disease, and would be in evidence around the top of the stump or in cuts on its base. Still another is the so-called "pink fungus" (*Corticium javanicum* Zimm.) which affects Pará, tea, and other plants in India and Ceylon. This fungus attacks the trunk usually at the fork of the branch and may be easily identified by its pinkish color.

Thus far all Pará plants in the Philippines seem to be free from leaf diseases, but a close watch should be kept by planters and prompt steps for the destruction of any leaf-blight, as soon as evident, should be taken.

The common Fomes disease, though a very serious matter in Malaya, is nothing to be frightened about thus far in the Philippines; this fungus spreads only in wet or badly drained soils. It is probably more or less common throughout the Oriental tropics; if not promptly attended to in a plantation it can cause very heavy losses.

There is comparatively little risk of introducing the germs of these fungi on seeds, although, of course, there would be considerable danger if soil were used in packing.

We take this opportunity to call attention to the fact that Pará seeds coming from Singapore and any of the Malay States should *not* be packed in fresh charcoal. Charcoal which has not been "*weathered*" is almost "*sure death*" to any seed which does not endure drying out, and a great amount of valuable material has been lost in recent years through ignorance or carelessness on this point. By far the best material for packing Pará seeds is coconut-husk dust, in a "*tobacco moist*" condition. Seeds can easily be kept for six months in this material whereas they would probably not endure more than six days in charcoal. As a substitute for coconut-husk dust, sawdust or sphagnum moss may be used, but care should always be taken that there is no excess of moisture. It must be remembered that all live seeds breathe, especially those which do not immediately become dry after maturity, and allowance should be made therefor by means of ventilating the packing case.

The fatal effects of charcoal upon the seeds are due to the fact that fresh charcoal has the property of condensing gases on its surface, and since even a small lump of charcoal has really a tremendous area of surface (on account of its porous cellular structure), we can understand how the vital gases in a box of seeds can be practically removed and the normal respiration processes inhibited thereby.

ANOTHER MANGO PEST IN THE PHILIPPINES.

By P. J. WESTER, *Horticulturist*.

In the June, 1911, number of the REVIEW the writer communicated the discovery of the presence in the Philippines of two insect pests, one of a particularly serious character that "blights" the mango bloom. It is, therefore, with great reluctance that he now calls attention to another pest, that might become no less destructive, and which attacks the partly developed and nearly mature fruit. This pest has been found in four provinces in Luzon, and if not identical with, is a very near relative to *Dacus ferrugineus*, so destructive to the mango in Java and other parts of Malayasia, and is also related to *Trypeta ludens* which, in Mexico, attacks the mango, orange, and guava.

The attention of the writer was first drawn to this insect during a visit, May 13, to the Lamao experiment station, Bataan, where he was attracted by the unusual number of "drops" under the mango trees growing at the station. An examination of the fruit, both on the trees and on the ground, disclosed numerous fruits on the trees in different stages of development having one or more minute cavities caused by the eating out, by some insect, of a little of the epidermis and flesh of the fruit—some probably a week or more old, others freshly made. In most cavities were found deposited one to several slender, white eggs, about one millimeter long, the surrounding flesh, in the older cavities, having begun to decay. Eggs were also found in injuries caused by the rubbing of fruits against branches of the tree by the wind, or small cracks due, perhaps, to the heavy summer rains and rapid growth of the fruit; but, though a careful examination was made of numerous fruits, in no instance were larvæ found in fruit which was still on the tree. The decaying fruit on the ground was riddled by myriads of whitish maggots which devour only the flesh of the fruit; a few large, red-banded lepidopterous larvæ were discovered inside the horny covering of the seed, feeding upon the kernel. One fully grown

fruit was picked from which the larva, after having devoured the seed, had made its way out of the fruit to pupate. This latter insect hardly appears in sufficient numbers, thus far, to be called a pest.

Later the writer has had occasion, in connection with his mango-breeding work, to visit several of the mango-growing districts of Luzon. The hogs, kept by the natives, clean up all "drops," and in most places it is, therefore, difficult to find any fruit on the ground. At Imus, Cavite, apparently sound fruit was picked from trees and brought to Manila that on ripening was found to be swarming with maggots identical with those found at Lamao. In the mango orchard of McCondray & Co., in Muntinlupa, Rizal, an adult fruit-fly was discovered on a bunch of mangos, and in Pulilan, Bulacan, many were seen in a grove of bearing trees; ripening fruits were here picked from the trees, as well as in Muntinlupa, and found to be infested with maggots, for which this fly is probably responsible. The injury to the crop in Muntinlupa from this pest did not appear to be serious, but in Lamao the loss was conservatively estimated to be not less than 15 per cent of the crop.

In connection with the above the following excerpt, from an unpublished manuscript prepared by the writer on the culture of the mango, may be of interest:

Perhaps the most serious insect pests of the mango are the fruit-flies, of which three species are particularly conspicuous; the Mango fruit-fly (*Dacus ferrugineus* Fabr.), the Queensland fruit-fly (*Dacus tryoni* Froggatt), and the Mexican fruit-fly (*Trypeta ludens* Loew).

The mango fruit-fly is found in India, Java, Ceylon, and Amboina, where it is very destructive to the mango and probably occurs in many other islands in Malayasia. The species also infests the orange and other fruits.

The Queensland fruit-fly ranges from India and Ceylon to Java, Amboina, and Australia (in Queensland and New South Wales). It is commonly a mango pest but is also destructive to bananas, oranges, peaches, and other fruits. Both these species, in the adult stage, are small, active flies that lay their eggs on the fruits, into which the larvæ burrow rendering them unfit for consumption. Having attained their full size the larvæ leave the fruit and pupate in the ground. The fruit-flies have been reported to be especially destructive to the mango in Java; over 50 species of the genus *Dacus* have been described from Malayasia, and it is probable that several of these, beside the two species that are particularly conspicuous mango pests, are more or less injurious to the mango.

The Mexican fruit-fly appears to be the only serious mango pest in the Western Hemisphere. This insect is thought to be of South American origin but it is its attacks on the mango, orange, and guava in Mexico (chiefly in the state of Morelos) that has made it known as a serious insect pest. The small fly lays the eggs under the skin of the nearly ripe fruit and the larvæ destroy it in the same manner as do the larvæ of the other fruit-flies. The larvæ usually leave the fruit and pupate in the

ground, although occasionally the chrysalis stage is passed inside the fruit. The fact that all the species enumerated infest other fruits than the mango renders them the more dangerous and correspondingly difficult to control.

Remedies: The fruit-flies may be controlled, to some extent, by gathering and burning all "drops" and refuse fruits before the larvæ leave and enter the ground to pupate. In Mexico, in the warfare against the Mexican fruit-fly, the predilection of these insects for sweets led to the experimentation with a spray made from the decoction of a poisonous herb, *Haplophyton cimicidum* A. D. C., sweetened with sugar and sprayed on the infested trees. The spray is prepared by boiling 1 kilogram of the herb, cut fine, in 10 liters of water, straining the infusion and dissolving in it 1 kilogram of sugar. The remedy was found effective and where the herb is found in abundance it may be used to advantage in the control of the pest.¹

The spray, of which the formula is given below, has been found very effective by C. W. Mally, in South Africa, in combating the Mediterranean fruit-fly (*Ceratitis capitata* Wied), so destructive to the fruits of that country, and there is every probability that it would, on trial, be found equally effective in the destruction of all the fruit-flies affecting the mango, provided that they are attracted to sweet substances as are the Mediterranean and Mexican fruit-flies. In the course of his experiments with this spray Mally found that the percentage of infested fruit dropped from 50 per cent in unsprayed trees to 1 per cent in those that were treated. Bees are not attracted by this bait and there is no danger of poisoning from eating the fruit from the sprayed trees.

Mally recommends that the first application be made a month before the presence of the larvæ in the fruit is expected and thereafter an application every ten to fourteen days is thought advisable. The aim should be to have the poisoned bait on the trees as long as the flies are present in the orchard. A comparatively small amount of the spray is applied to each tree, or about 1 to 1.5 liters to a tree of about 6 to 7.5 meters spread.

In applying the spray, the nozzle should be directed so that the liquid falls in small drops over and through the trees.²

Besides the poisoning of the adult flies, their liking for certain oils may be used in order to trap and destroy them. *Dacus ferrugineus*, in this way, may be attracted by citronella oil; and *Ceratitis capitata*, by kerosene.³

These traps consist of shallow pans filled with water, over which a small amount of oil is poured, placed in the fly-infested orchards.

FORMULA OF THE MALLY FRUIT-FLY REMEDY.

Arsenate of lead	kilograms.....	0.6
Sugar	do.....	7.5
Water	liters.....	100

Dissolve the arsenate of lead in a small quantity of water, dilute to 100 gallons and add sugar.

¹ Cooper, Ellwood, *Trypeta ludens*, in Mexico, 1905, p. 31.

² Agricultural Journal, Cape of Good Hope, 1909, vol. 34, pp. 620-633; vol. 35, pp. 578-581.

³ W. W. Froggatt, Farmers' Bulletin No. 24, Department of Agriculture, New South Wales, 1909, pp. 7 and 8.

If it is desired to prepare the spray from the ingredients used in the manufacture of arsenate of lead, use the following formula:

Arsenate of soda	grams....	180
Acetate of lead	do.....	450
Sugar	kilograms....	7.5
Water	liters....	100

Dissolve the arsenate of soda and the acetate of lead separately, in wooden or granite vessels, in 4 liters of preferably hot water. When dissolved, pour the contents of the two vessels simultaneously into the sugar solution.

Should the fruit-fly referred to appear in such numbers as to become a pest in the mango-growing districts in the Philippines, the remedies discussed above are recommended for its control.

The Bureau will make a study of the life history and habits of the insect and the extent of its spread throughout the Archipelago, particularly in those districts where mango growing is one of the more important industries.

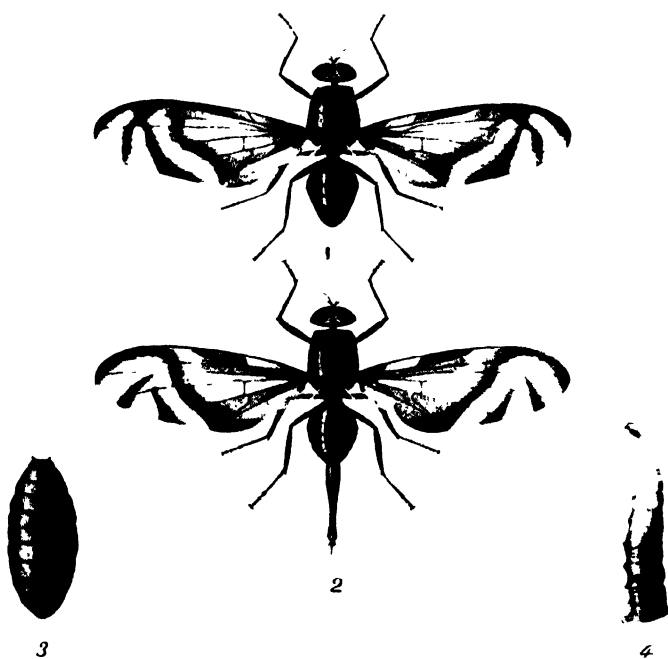


PLATE III - MEXICAN FRUIT-FLY (*Tropeta bidens* Loew) (1) male adult, (2) female, (3) pupa, (4) larva

Reproduced from a colored illustration in *Tropeta bidens* in Mexico, by Ellwood Cooper

A NEW METHOD OF CONTROLLING TERMITES THROUGHOUT THE TROPICS.

From notes furnished by D. B. MACKIE,
Agricultural Inspector.

The various species of white ants, or termites, constitute one of the most serious insect pests on cultivated estates in the Tropics. In some countries only dead wood is attacked while in others even living plant tissues are devoured, especially in case of the temporary scarcity of decaying timber; for instance, immediately after the clearing of a forest area. The damage to live plants is usually comparatively insignificant as compared to the destruction of timber, wooden implements, etc., about estate buildings. Even in places as far north as Washington, D. C., U. S. A., certain species enter houses and destroy books, furniture, etc.

Attempts along the line of rendering timber used in the construction of buildings, etc., obnoxious or impermeable to termite attacks have been carried on for the last decade or more, but it is only within the last few years that a really scientific method of directly combatting the pest itself has been worked out. Of course, timbers can be soaked in tar, creosote, or any number of chemical preparations, thus protecting the material from the pest. Moreover, it is a fairly simple, though not always effective plan, to destroy the queens of the species which construct nests of earth for the rearing of their young; however, since it is almost impossible to destroy an entire colony, even by the use of kerosene, arsenic, or carbon bisulphide, this method has been rather unsatisfactory.

It has long been known that termites are particularly sensitive to arsenic and at the same time are very easily killed or driven away by either arsenical baits, or by white arsenic itself deposited in the galleries of the nest. In order to make the destruction of the colony complete, then, it is only necessary to carry arsenic, in some form, throughout the nest and all of the galleries leading to it. It is now known that the vapor of white arsenic and

sulphur burned together in a suitable receptacle and introduced into the nest, or even one of the main galleries leading thereto, will permeate the entire structure of the colony leaving a poisonous deposit throughout the course of the fumes, and at the same time immediately killing nearly all of the insects by suffocation. All that is required is a metal box of some sort, which can be readily heated from beneath, connected with a flexible tube which can be inserted into the nest, or main gallery. The lid of the box should, of course, fit tightly and there must be some sort of a pumping apparatus to force the fumes out of the poison chest through the flexible tube and to the extremity of the smallest gallery, even if it be 20 meters from the central nest. Machines are now on the market at a reasonable price for performing this operation. The principle is the same in all; that is, a charcoal-burning stove carrying a fume chamber on top forms one piece and a hand pump, which forces air into the fume chamber—thus driving the fumes into the nest—forms the second piece. Rubber tubing connects the pump with the main apparatus and at the end of the hose leading from the fume chest is a metal point for thrusting into the hard structures of the nest.

About three parts of sulphur to one part of arsenic is the best combination of the fume substances; the heat of the charcoal is sufficient to vaporize both the sulphur and arsenic and these vapors combine more or less forming arsenic trisulphide which is deposited throughout the galleries of the nest and also upon the individual insects. A nest so treated is probably never again habitable by any colony that might attempt to annex the abandoned structure.

The operation of this fume apparatus is exceedingly simple, there being but few chances for a mistake to be made in its manipulation. It should be remembered, however, that moist clay, or something similar, should be placed around the nozzle of the fume hose at the point of its entrance into the nest, gallery, or infested timber; this air-tight packing will prevent the escape of the fumes. In the case of ground infested by termites whose nests are not plainly in evidence, a rod may be used to make an opening into the earth wherein the galleries are suspected to be situated. Except in very heavy soil these artificial galleries generally break into one or more of the termite tunnels and thus the fume hose inserted into the hole made by the bar or stick will convey the fumes to the nest and galleries within a reasonable distance therefrom.

Five minutes of pumping is generally sufficient to impregnate the nest and galleries with the fumes. In the case of beams or large timbers in buildings suspected of being infested with termites, a small auger may be used to explore the interior of the wood; when a gallery is located all that is necessary is to attach the apparatus, pack the point of entrance of the hose nozzle with mud and pump in the poison.

A heaping teaspoonful of the poisoned mixture is usually sufficient for treating an ordinary nest. It should be remembered that the insects are not all immediately killed no matter how thorough the fumigation, but if the operation is well performed no insect should be in evidence after a period of forty-eight hours. This is explained by the fact that death is caused not entirely by asphyxiation but probably by the irritant action of the arsenic as well.

One of these machines, which are now procurable in Manila, should be in the hands of every estate owner who suspects the presence of this usually invisible but really very serious insect enemy.

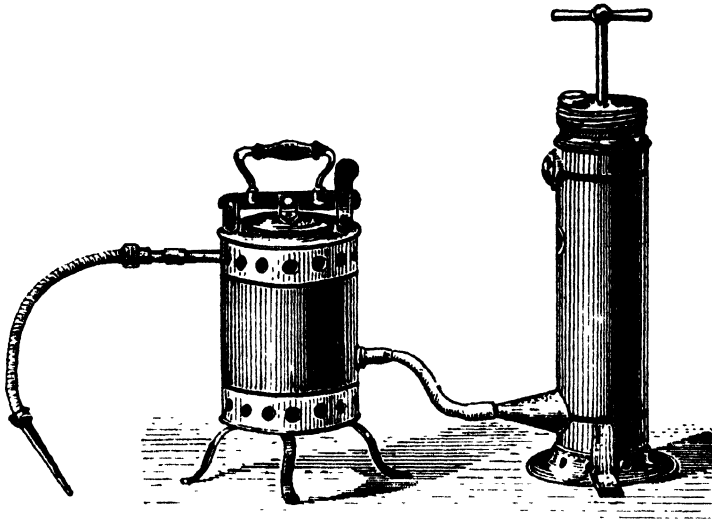


FIG. 1 -- Pump, fume chest, etc., used for destroying termites.

RINDERPEST ON KABARUYAN ISLAND.

From report by Dr. C. H. DECKER.

Kabaruyan Island, about 25 kilometers long by 15 wide, is situated in the western part of Lingayen Gulf, and forms part of the Province of Pangasinan. The chief industry of this island, on account of its rolling surface and an abundance of forage, is stock raising, especially cattle, which are exported to other parts of Pangasinan, and sometimes to other provinces as well.

In connection with the recent outbreak of rinderpest in Kabaruyan, and its subsequent eradication, the following facts may be of interest to readers of the REVIEW.

During the early part of April, 1911, a number of carabaos, which had been rented by residents of Alaminos from their owners on the Island, were returned to these owners, carrying back to Kabaruyan with them a very virulent form of rinderpest which was then raging on the mainland of Pangasinan.

On the appearance of the disease, the Bureau of Agriculture was notified, and Mr. J. J. Miller was sent to investigate conditions. As the infection seemed to be confined to the northern part of the Island, Mr. Miller requested that a double fence be built across Kabaruyan to prevent the large herds in the southern part from becoming infected. Soon after the completion of this fence, Mr. Miller was relieved by Mr. B. J. Egan, who soon discovered that infection was appearing in the territory south of the double fences. As this showed that a serious outbreak was under way, Dr. Chas. H. Decker was placed in charge. Doctor Decker found that the disease was rampant in all parts of the island, the animals dying at the rate of 140 a week.

Owing to the fact that the animals were in a semiwild state, the usual method of tying in situ could not be resorted to, and it was also extremely difficult to collect them so that the owners could furnish the necessary food and water. The problem was solved, however, by each owner fencing in his own animals in places having a natural supply of both food and water. With

the aid and under the direction of Bureau inspectors, the municipal president, and Constabulary soldiers, this was soon done.

In cases where the haciendas were distant from the rice fields, small corrals were built near the latter and the animals were guarded by Constabulary soldiers while en route thereto; they were also guarded night and day while work was going on, as well as during their return to the haciendas, thus preventing contact with other animals or exposure to other sources of infection. By this method rinderpest was eradicated from the island, and on September 14, 1911, the quarantine was raised.

The campaign was remarkable in several ways; considering the virulent form of the disease, and the susceptibility of the animals thereto—due to the fact that the island had been free from rinderpest since 1888—the percentage of deaths was small; the disease had become widespread before an organized force was placed on the island; the campaign as a whole was very inexpensive, due to the fact that the people of the island gave their services without pay, and to the fact that the Filipino inspectors received but half the salary usually paid to them, without traveling expenses.

The campaign plainly shows the advantages of having all animals fenced in so as to prevent the infected herds from coming in contact with the noninfected herds, and also shows that with the good will of the municipal officials and the people as a whole rinderpest even of the most virulent type can be stamped out of a locality.

A summary of the number of cases, deaths, and recoveries for each month follows:

Period ending—	Cases		Deaths.		Recovered	
	Carabaos	Cattle	Carabaos	Cattle	Carabaos	Cattle
April 29, 1911	111	48	51	29	0	0
May 27, 1911	137	335	96	218	48	10
June 27, 1911	328	464	246	421	50	121
July 29, 1911	36	36	43	46	73	36
August 31, 1911	0	0	1	0	4	2
September 14, 1911	0	0	0	0	0	0
Grand total	612	883	437	714	175	169

Percentage of deaths: Carabaos, 71; cattle, 80.

Señor Narciso Pecson, the municipal president of Anda—the only municipality on the Island—was in the saddle nearly all of the time, explaining to the people the reasons for the quarantine, and also helping to enforce it. His personal in-

fluence and his work in the field were of great assistance, and in commending him it is safe to state that he is one of the most energetic and efficient presidents in the Archipelago and has at heart the uplift of his people.

The people as a whole were in favor of the quarantine and did all in their power to make it a success by building fences, building and guarding detention corrals, and doing police duty *without pay*.

The twenty Constabulary soldiers of the First Company of Pangasinan are to be commended for their eagerness to help make the quarantine a success by aiding in the inspection of animals, and for their efficient maintenance of day and night patrol of infected districts.

REVIEW OF THE REPORT OF THE FIBER EXPERT ON JAVA AND THE SURABAYA FIBER CONGRESS.

By R. J. FISKE, *Agricultural Inspector.*

Mr. M. M. Saleeby, fiber expert of the Bureau of Agriculture, who represented the Philippine Islands at the Surabaya Fiber Congress held at Surabaya, Java, from the 4th to the 8th of July, and who afterwards made an original investigation of agricultural conditions in the island, returned to Manila on August 25.

The Surabaya Fiber Congress was called to discuss matters of interest pertaining to the important world fibers. Delegates from many countries were present, the Philippines being represented by Mr. Saleeby, while the United States sent Prof. Lyster H. Dewey, of the United States Department of Agriculture.

Mr. Saleeby left Manila June 13 and arrived in Surabaya on the 27th. From this date until July 3 his time was spent in installing the Philippine exhibit of fibers, which was the largest at the congress.

The congress was held in a special hall adjoining the division set aside for the machinery exhibit. This hall was provided with a complete collection of charts, specimens, statistics, and illustrations which proved extremely helpful in satisfactorily discussing and demonstrating the different phases of the fiber industries.

Three classes of persons attended the congress: Members of the Netherlands India Agricultural Association, who were all managers of extensive estates and therefore men of large experience; scientific men, mostly experts of the department of agriculture for the Dutch East Indies, and also representatives of foreign countries; and manufacturers, business men, and mechanics, who were familiar with the cleaning, baling, marketing, and market requirements of commercial fibers.

Agave fibers (Yucatan sisal, true sisal, and maguey) were discussed on the first day of the congress, July 4. It is believed

that the cultivation of maguey in the eastern tropics will greatly increase, owing to satisfactory environment and the superior quality of its fiber.

The only serious disease of the agaves so far discovered in the eastern Tropics is the blackrot of Java, introduced from the Bahamas, or from Hawaii, which attacks the true sisal plants only, leaving the maguey uninjured. Agave diseases are much more numerous in tropical America, to which the plants are indigenous. Probably the most serious disease in the Bahamas is bacterial in origin. A comparatively new disease is one forming nodules on the fiber, described by Dr. A. L. Herrera, of the department of Fomento, Mexico, under the name *Elasmodiophora agaves*, and not yet known to exist outside of Mexico. In Java it was found that both lightning and intense heat affect the leaves.

The following are the conclusions reached by the special committee reporting on agaves:

The cultivation of *Agave sisalana* and *Agave cantala* in Java is not profitable on lands that do not permit of cheap transportation of the raw material (leaves), nor is it profitable where, owing to poor soil or a cool climate, the production falls below 500 kilos of dry fiber per bouw ($\frac{1}{10}$ hectare). It may be profitable on lands with little humus, providing they are well drained and not more than 350 meters above sea level. The cultivation of agaves is most profitable on estates where they are not the only crops grown, but sisal is not suitable for interplanting with other crops. Low growing, nonclimbing leguminous crops between the rows of sisal is beneficial. A central factory is to be desired, while a system of local factories in different parts of a large estate is only permissible where the topography does not admit of cheap transportation. If the estate produces more than 200 tons of fiber, automatic cleaning machines are necessary.

Plantations of less than 280 hectares are not profitable if sisal is the principal crop while 140 hectares is the minimum for profit if a secondary crop.

The committee on matting straws reported that the manufacture of cheap articles from these materials is more profitable than articles of luxury, as the market is wider and a larger quantity may be made for export. However, the production of either class of articles was not encouraged as the profit was too small, but if machinery could be used the industry would become much more profitable.

The committee on abacá reported as follows:

The cultivation of abacá on land where the raw material can not be cheaply transported is not profitable unless small portable machines or hand cleaning is resorted to, nor is it profitable in locations where the production falls below 1,000 kilos per hectare.

Abacá in Java requires a loose soil rich in humus and not more than 500 meters above sea level. Under favorable conditions the production may be as much as 2½ tons of dry fiber per bouw per year (3,570 kilos per hectare).

It is desirable to combine abacá with other crops on the same estate but interplanting of other crops with abacá is to be discouraged.

A central cleaning plant is much more profitable on large estates than several local plants unless the nature of the land is such that the cost of transportation of the raw material is prohibitory.

If abacá is to be the principal crop the estate should contain at least 175 hectares, although, if secondary, 35 hectares may be profitable.

The expenses of harvesting, cleaning, transporting to port of shipment, freight, commission and selling, total ₧140 per metric ton. The value in the Netherlands may be placed at ₧228 per ton, and the profit at ₧88 per ton. The net profit of a minimum production of 1,000 kilos per hectare is 5 per cent; with a production of 2,000 kilos, 20 per cent.

Java jute (*Hibiscus cannabinus*) was discussed on the 5th.

The climate of central and east Java, and on the greater part of the neighboring islands, is suitable to jute cultivation. Only ordinary rainfall is required and slight variations in temperature do not seriously affect its growth. The soil must not be very poor nor should it be particularly rich but must be very well drained, for an excess of moisture left standing on the soil will injure the roots in a comparative short time.

The consensus of opinion was that Java jute can not profitably be grown by European planters until satisfactory machinery for cleaning the fiber has been put on the market.

Kapok is a good secondary crop for the native farmer but European planters making it their principal crop will usually find the profits small. It is recommended that it be combined with cacao, coffee, etc., or with cattle raising.

The consumption of kapok is increasing all over the world, but officials in other tropical countries are encouraging its production so that future competition may be expected.

Experiments have lately been made by some planters in Sumatra to raise cotton as a catch crop with rubber during the first two years, for the purpose of helping to defray the expenses of the rubber plants while young. The results seem to be in favor of this method, and it was shown that at least 11½ piculs of cotton can be produced on every hectare within a period of four and one-half months. Some rubber companies have already decided to plant cotton on the whole of the area planted in rubber.

Cotton lands should not be permitted to be overrun with "alang alang" (cogon).

The prospects for European cultivation of cotton are not unfavorable, especially if carried on in connection with other crops, i. e., mixed farming.

The three days following the close of the congress were spent

in Surabaya and vicinity where a visit was made to the Boedoe-ran and Tangoelangan sugar mills and plantations.

Sugar is by far the most important agricultural product of Java. Immense areas of level land are planted to it to the gradual exclusion of rice; the eastern and central residencies owe their prosperity to this industry. Large numbers of modern sugar mills and refineries handle the immense crops and during June and November are kept busy day and night.

Plowing, planting, cultivating, and harvesting are all done by hand. The final operations of milling, refining, and transportation, however, are carried on by the most up-to-date methods, in which modern machinery takes the place of manual labor.

The Kedawoeng and Karang Genang maguey plantations were visited. On the first the plants are set out 3 by 1 meters but on the latter the distance is less, the superintendent believing that the closer planting reduces the cost of cleaning more than the difference in the yield. The leaves are harvested three times a year after the fourth year, but not more than ten are cut at one time; between the third and fourth years, however, only ten leaves are taken from one plant, and this is done in not less than two cuttings. Three raspadores are used on the first plantation to extract the fiber while on the second a Prieto machine, Irene No. 21, supplemented by two raspadores, is sufficient. It is not unusual to hear of 2,000 laborers on one plantation while on some of the larger plantations 10,000 men are employed. Wages are very cheap and ordinarily do not average more than ₱0.25 to ₱0.35 per day.

In summing up the coffee situation, Mr. Saleeby says that the cultivation of the Robusta species is increasing at the expense of the Java and the Liberian. The Java and Liberian coffees are liable at any time to be completely destroyed by diseases against which all efforts have proved futile. So far no serious diseases have attacked the Robusta variety although probably as it becomes more widely cultivated some disease will develop. However, Robusta coffee is only planted as a catch crop with rubber or other staple crops, which insures the planter against overproduction and materially reduces the cost of bringing the rubber to bearing.

The Robusta begins bearing from the second year up, insuring a good crop from about the third year. In east Java, where the plant grows best, several plantations have announced a crop of 28½ piculs per hectare. The average yield on the estates visited was 7 piculs per hectare, for plants between three and four years old.

The price for Robusta coffee is, as a rule, only 10 per cent less than that paid for the Liberian. This is considered very high and if the price is maintained its production will probably increase. The present Amsterdam quotations are ₧28 for Robusta and ₧32 for Liberian, per picul (63.25 kilos).

The rubber boom, which swept over the Federated Malay States in 1904 to 1906 and which struck Java about two years later, resulted in large areas of rubber being planted, capital coming from Holland and other parts of Europe as well as from Java. So large are the plantations in Java and the neighboring islands of the Dutch East Indies that rubber promises to be second only to sugar, and as all the work of caring for a rubber plantation must be done by hand the labor problem will soon be acute, even in densely populated Java, with the result that many of the minor industries will probably die out as the cost of the labor will thereby increase to a point above that at which they are profitable.

But two species of rubber are cultivated in the island, Pará (*Hevea braziliense*) and Indian rubber (*Ficus elastica*).

Clean cultivation is generally practiced although the interplanting of vines which closely cover the soil is gradually coming into favor. Pará trees five years of age yield on the average 2 pounds per year, some trees yielding as much as 3 pounds. Ficus trees, while growing more rapidly and being hardier, are best adapted to inferior soils where less care and attention can be given them as their yield is less than the Pará.

The rubber industry under favorable conditions is one of the most profitable agricultural undertakings at the present time. However, many companies have failed because the promoters, either in good faith or from obvious reasons, have figured out fabulous profits, on paper.

The rubber brokers, as well as managers of large rubber estates in Singapore, who were interviewed on the subject seem to concur in the belief that an oversupply of the market is to be feared and that a great drop in prices will take place during the coming year. They went so far as to say that they believed it will only be a question of a few years when the price will fall to ₧1 per pound. At such a price, they further stated, no oversupply will ever take place owing to the great number of uses to which rubber will be put, and from which it is now barred by the excessive cost. This does not mean that the present rubber companies in the East will be doomed. Indeed, the largest and most stable have started with the above situation of the rubber industry clearly in mind, and have calculated their profits on this basis.

This broad and rational view of the rubber industry is based on actual figures, and it must be borne in mind by all prospective rubber planters in the Philippines. While large dividends have been paid by *some* rubber companies, even in excess of 100 per cent, this can not continue for any length of time, besides which the cost of production here in the Philippines is considerably higher than in any other of the rubber countries in the East. However, even with the price at ₱1 per pound, rubber is said to give between 30 and 50 per cent dividends, providing the industry is carried on under favorable conditions and great care is given to its different details.

The planting of tea is made from seed, which is generally set out at a distance of 1 by 1½ meters. No shade trees are planted between the rows, and the field must be kept clean from all weeds or undergrowth. Women and children are continually engaged in harvesting the leaves, which may be done at eighteen months from planting, each plant being gone over every eight or ten days. Usually three or four fresh leaves are taken from each shoot. The cost of producing, packing, and marketing is usually estimated at ₱0.15 to ₱0.20 per pound. At the latter figure a conservative estimate per hectare is ₱300; according to the lowest estimate of Java planters the net income from a hectare is 25 per cent higher than the above.

The hat industry is a very important one in Java. The work is all done by hand, and machines are only used in blocking and finishing those hats intended for the local European market. The hats for export are all made by the natives in their homes. All the hats made by the natives and the greater part of those made at the factory are either ordinary bamboo or pandan hats. Up to a year ago the demand from Europe and the United States was exclusively for bamboo hats, but lately the demand for pandan hats has rapidly increased in preference to those of bamboo. The demand is restricted to the cheap coarse grades of both kinds. The natives of Java can not turn out the fine grades of hats that are made here in the Islands, but it appears that they may be relied upon to work more steadily and turn out hats at a much lower cost.

The demand for bamboo and pandan hats for ladies has lately been increasing. The hats are now required to have a very wide broad brim and Mr. Petit-Jean (manager of a hat factory west of Batavia) is finding it difficult to meet the requirements, owing to the fact that the fiber required is often longer than the space between the culm of the bamboo. The natives of Java evidently can not join the ends of the fibers in such a manner as to leave

no trace of the joint, as is done by the hat makers in the Philippines. With the pandan hats no such difficulty is encountered.

Mr. Petit-Jean is also turning out good "Panama" hats made from fiber grown on his plantation near Buitenzorg. This plantation of Panama hat plants (*Carludovica palmata*) is flourishing, and the fiber, or rather the young fresh leaves produced, compares very favorably with the "Panama" fiber of Porto Rico and Central America.

APPENDIX.

Mr. Saleeby brought back with him the following plants for propagation in the Philippines: 34 palms, 2 trees, 2 pandans, 14 large and 20 small shrubs, 8 vines, 43 herbaceous annuals, and over 100 miscellaneous seeds and plants.

A REVIEW OF THE SCOPE AND METHODS OF TROPICAL VETERINARY ENTOMOLOGY.¹

By M. B. MITZMAIN, *Entomologist.*

We feel justified in claiming for veterinary entomology a clearly defined branch of science since it holds on its records the earliest of the clearly demonstrated cases of the transfer of disease by insects, namely, the transmission of Texas fever by cattle ticks. Professor Novy says:

The recognition of the part played by the anopheles mosquito in the transmission of disease constitutes one of the brilliant achievements in science, and we must not forget that this result was largely rendered possible by the equally remarkable demonstration of Smith and Kilbourn that the Texas fever of cattle was spread through the agency of ticks.

Sir Lander Brunton once made the remark in an address before the London School of Tropical Medicine that the study of many of the important diseases of the Tropics was fast becoming narrowed down into a study of the insects which disseminate them.

The various scientific expeditions in the epidemiology of modern infectious diseases brings to light strongly the importance of medical and veterinary entomology. All of these researches have more or less centered about insect carriers as prime agents in the propagation of epidemics and epizootics. The importance of this division of science is emphasized by a mere reference to a few medical commissions, such as the Yellow Fever Commission in the United States, the Sleeping Sickness Commission in Africa, the English Plague Commission in India, and recently the International Plague Commission in China.

In order to obtain a comprehensive perspective of this branch of parasitology, I shall review some biological considerations in the attempt to orient in your minds the position which veterinary entomology holds in association with its zoölogical allies.

Origin of parasitism.—Modern parasites are restricted more or less completely to a particular host animal which would neces-

¹ Submitted February 27, 1911.

sitate the deduction that the parasite must have developed its habits after the existence of the host, and in consequence, that parasitism must be a recently acquired habit. This thought is further expressed by the study of the life history of the parasite—invariably the earlier stages point to a free-living existence. Perhaps the ancestors of the whole group of modern parasites were attracted to the waste food, offal, and excretions of certain animals. The search for food may have become simplified. They began living as messmates or commensalists or as scavengers. The association between the two species became close and eventually the life of parasitism was completed. This is also borne out by a study of the nearest allies of a given parasite, and of members of a given family of parasites in which the gradations from the free-living larva to the parasite may be traced.

Effect of parasitism on the host.—That an animal is parasitized does not necessarily involve the host in death nor even in great inconvenience, even though the parasite is actually living at its expense. The presence of a few bots in the stomach of a horse may not affect the horse in the least, nor would the presence of a few ticks on the body of an animal affect the animal, but with the multiplication of these parasites there will be increased inconvenience in both hosts. The presence of a few maggots in the fleshy part of the sheep's leg might cause little damage, but let these be in the nasal sinus or at the base of the brain, and the gravity of the situation will be greatly augmented. Thus the effect of parasitism on the host is dependent on the numbers and the position of the parasite.

Effect of parasitism on the parasite.—All parasites are more or less specialized in the direction of their habits. e. g., hairs; lice are horizontally flattened and are provided with clasping organs to hold fast to hairs, and both of these examples are wingless and have sacrificed ordinary means of locomotion. In the parasites generally, perhaps because of the ease in securing food, the sense organs are usually not strongly developed, as for example, the eyes may be wanting or very simple. The mouth parts may differ in the several groups dependent on their special adaptation, as in the fleshy mouth parts of the blow and house flies and in the piercing organs of the stable and horn flies. It is interesting to note that parasitic habits have resulted in the development of structural similarity. This is, especially true in the clasping structures of the biting and sucking lice which belong systematically to two different orders, viz, the *Mallophaga* and the *Hemiptera*.

Internal parasitism.—There are no insects as far as is known which spend their entire life history in the form of internal parasites. There are, however, a number which pass their larval period (period of growth) within the alimentary canal or in the muscular tissues of higher animals. The best known representatives of this group are the bot flies and the warble flies, the former found mainly in the stomach of equines, while the latter are found in the muscle tissue of bovine and equine animals, rodents, and sometimes man. The damage done by internal parasites is of various kinds; loss of nutrition must be considered and secondly the irritation caused by the burrowing parasites in the muscles or by the attachment of hooks to the stomach lining for purposes of prehension must be taken into account.

External parasites.—The most important and most abundant external parasites of man and of the domesticated animal are found among the insects and arachnids. Very serious and often fatal results are due to this form of irritation, and the loss of blood due to an abundance of blood-sucking species must not be overlooked. External parasites may be either permanent or temporary. Among the permanent parasites are the biting and sucking lice, which are usually transferred from the host by close intercommunication with mammals while sleeping together, or closely huddled—in poultry generally while roosting. While these permanent ectoparasites are not so largely concerned in the direct transmission of infectious disease (direct infection), yet certain sucking lice are known to carry *Trypanosoma*. The temporary ectoparasites are the most important of all disease carriers, due to their frequent change of host—cropping off or flying away from one to another of the same or of a different species from the first host. It may be well seen that herein lies the danger of transmitting infectious diseases from animal to animal. These temporary ectoparasites are well represented by the fleas, bedbugs, ticks, and flies.

Importance of mouth parts.—When an insect becomes a pathological factor it is indeed significant to know the type involved and the mode of infection. It becomes evident that an insect possessing mouth parts capable of penetrating the skin of the higher animals must be looked upon as a possible carrier of blood infection, although it may in actual experience never attack such animals. If the insect is provided with mouth parts of the usual biting type it cannot relate to the transmission of affections introduced through the circulation, except by rare accident through a previously inflicted open wound. The mosquito would be harmless as far as malaria and yellow fever

are concerned if the mouth parts were of the mandibulate or biting type. These insects, together with certain other species such as the stable fly (*Stomoxys calcitrans*), tsetse flies, and ticks, are important because of the power which they possess of piercing the skin of the higher animals and introducing parasitic organisms directly into the blood. The house fly, on the other hand, cannot introduce organisms directly into the circulation because its mouth parts are not of the piercing type. These creatures are attracted by and often breed in excremental matter; if they are then attracted to the food of human beings, the pathogenic organisms from their mouth parts and feet are deposited thereon.

The actual measures of control are often quite dependent on a knowledge of the mouth parts.

In the study of medical entomology it is no longer applicable to divide the insects into only two groups as based on the mouth parts, namely, mandibulate or biting, and haustellate or sucking. This fact becomes clearer if it is considered that both the house fly (*Musca domestica*) and the stable fly (*Stomoxys calcitrans*) have sucking mouth parts and belong to the same family—*Muscidæ*, indeed, are systematically very closely related, yet from the standpoint of disease transmission they are widely separated. By virtue of the piercing structures composing the mouth parts of the stable-fly and horse-fly it relates them to direct infection while the house-fly and blow-fly proboscides, quite ineffective for piercing, relate them to indirect infection; they are not, however, of less importance as disease transmitters.

Relation of specific organisms to insect carriers and mode of transmission.—The transmission of most of the blood protozoa by means of insects is now a recognized fact, but the exact part played by such carriers is as yet, in many instances, not fully established. This is particularly true of the trypanosomes and spirochætes, and for that reason it will not be out of place to consider the several ways by which insects may convey disease organisms.

It has been customary for some years to speak of insects as passive and as active carriers, and these terms usually convey with them certain well-defined conceptions. Thus, in a general way, the passive carrier is looked upon as conveying bacteria, whereas the active carrier is connected with the transmission of protozoa. Now to what extent, if any, can the insect be utilized in distinguishing between the two groups, bacteria and protozoa?

According to Stiles there are two general rules with reference to parasites and disease, and these it will be seen are framed along the lines indicated above. He says: "The first rule, to

which at present a few exceptions are known, is that diseases which are accidentally spread by insects are caused by parasitic plants, particularly by bacteria. The second, to which no exceptions are as yet known, is that those diseases which are dependent on insects or other arthropods for their dissemination and transmission are caused by parasitic animals, particularly by sporozoa and worms."

It will be seen that the first rule deals with the passive or mechanical agent of transmission, and it is certainly true that until recently the bacteria were supposed to be about the only forms thus conveyed. The studies on trypanosomes, however, have shown that these protozoa are transmitted in essentially the same manner. Thus the supposition that the trypanosome of sleeping sickness multiplies in the gut of the tsetse fly which has not fed on infected animals has been shown to be erroneous. At all events it has been proven that the flagellates found in the stomachs of such flies are mere harmless parasites peculiar to the insect and are in no wise related to *Tr. gambiense*. The fact that the tsetse flies must bite within a few hours after their infective feed for an infection to result goes to show that such insects are mere mechanical or passive carriers.¹ For all practical purposes they may be compared to a syringe needle which has been dipped in infected blood. As long as the parasites remain alive on or within the needle it is possible to produce an infection by its use. The proboscis of the fly corresponds to the needle, and as long as living trypanosomes are present—and that time is measured by hours, or at most by a day or two—it is capable of causing infection. These facts apparently hold good for other trypanosomal infections, and hence, until it is shown that these organisms actually multiply within the insect host—as yet, apart from Schaudinn's work, which is open to serious question, there is no evidence that this occurs—the conclusion to be drawn is that such insects are mere passive carriers. Just as the house fly after soiling its feet or proboscis with typhoid bacilli is in a position to deposit such organisms on food and thus give rise to infection, so the biting flies in question seem to serve as mechanical agents in the transference of trypanosomes from one animal to another. It will be seen therefore that diseases which are accidentally spread by insects are not restricted to those of bacterial origin. In fact, from an epidemiological standpoint, the most important diseases thus conveyed are due to the trypanosomes. Hence the conception of a passive insect carrier to-day

¹ Only recently, however, Bruce has shown that reinfection in the tsetse fly takes place after long periods. Here the salivary glands are involved.

holds good for certain protozoa, even to a greater extent than for bacteria.

Turning our attention now to insects as active carriers of disease, some equally interesting deductions may be drawn. Notwithstanding the fact that it is possible experimentally to infect higher animals by injecting blood containing various plasmodia and most piroplasms, it is true that the natural infection by such protozoa invariably occurs through the agency of insects, such as mosquitos and ticks. It is a matter of common knowledge that the malarial organism in the mosquito passes through a complex cycle of development which requires some days and which must be completed before the insect is capable of transmitting the disease. A somewhat similar cycle has been recently worked out by Rogers for *Piroplasma canis*, and there can be no doubt that similar conditions obtain with hæmocytozoa other than those mentioned. It will be seen therefore that under natural conditions the transmission of these diseases is dependent on insects, and for this reason Stiles designates them as obligatory carriers. The artificial or accidental conveyance through wounds or by the injection of infected blood requires no special consideration, as such instances have no bearing upon the usual or natural mode of transmission.

Unlike the flies in trypanosomal disease where the part which they play is purely passive, mechanical, and temporary, the mosquito and tick in this second type of infections are to be considered as active, diseased, and permanent carriers. It is important to recognize that these insects are diseased, and with this idea in mind we may ask ourselves whether such a condition is brought about only by protozoa.

It will be seen that this question has an immediate bearing not only upon the nature of spirochaetes and piroplasms but also upon the unknown germ of yellow fever and rinderpest. With reference to the spirochaetes, more especially those of relapsing fever, it may be said that nearly all the facts which we have been able to gather go to show that these organisms are more closely allied to the bacteria than to any known protozoa. In one respect they approach protozoa, namely, in the fact that the tick-fever spirochaete (*Sp. duttoni*), and also that of chickens, is transmitted under natural conditions through the agency of a tick. The latter plays the part of an active host since it is capable of infecting weeks and months after its feed, and further, as in the case of Texas fever, the capacity to infect may be conveyed through the egg to the young tick. In other words, the tick and its offspring become diseased.

With transmission by contact or by inheritance there is strictly speaking no free or external life of the parasite, the organism passing directly from one living host into another, and this form of infection is often bound up with transmission by intermediate hosts. This mode would involve only a passive phase in the life history of the protozoan parasite, and in the majority of cases where the relation of parasites to intermediate hosts are fully made out the period in such a host involves some of the most important activities in the life of the parasite. Here are to be found some of the most perfect adaptations of means to an end that are known in biology; those forms which are not protected by resistant covering and where infection is brought about through the aid of an obligatory intermediate host are the most remarkable. The malaria organisms, for example, if sucked with the blood into the digestive tract of a mosquito of the genus *Anopheles*, are all digested save the conjugating forms, which are apparently endowed with some greater power of resistance than are the vegetative forms. But if the same parasites are taken into the stomach of a mosquito of the genus *Culex*, gametes, and other stages as well are alike digested; hence the various species of *Culex* cannot transmit malaria to man. Similarly with other forms of blood-dwelling parasites, each is apparently restricted to certain types of hosts, although in some cases a certain latitude in this direction is noted (*Trypanosoma brucei*, some species of *Babesia*, etc., may be carried by different hosts). The ultimate explanation of this resistance lies in the domain of physiological chemistry, and until this branch of biological science is more fully worked up the full significance of these adaptations will not be known.

In many of these cases the parasites undergo a definite developmental cycle in the body of the intermediate host, although in relatively few cases have the happenings in such cases been fully determined. In the cases of malaria organisms, *Herpetomonas*, *Leishmania donovani*, and some trypanosomes, the most important phases in the life history of the parasites—sexual reproduction, whereby the vitality is restored—are known to take place. In other cases, including the majority of trypanosomes and spirochaetes and most other protozoan disease-causing forms, little more than a sexual multiplication within the insect—the intermediate host—is known to occur.

In what manner are trypanosomes transmitted? Any blood-sucking fly feeding upon the blood of any animal suffering from trypanosomiasis would naturally transfer some of the hæmatozoa with the blood. That the presence of the living parasite in the

stomach of the fly by no means proves that the latter is capable of communicating the disease, and vice versa, if the motile organism is absent from the gut contents of the fly from an infected host, it does not prove that the insect is capable of producing the disease in a healthy susceptible animal. On the other hand, if the parasites remain alive in the alimentary canal sufficiently long, it is possible that some of them might find their way back into the proboscis and be subsequently introduced into the blood of another animal. It is also easy to suppose that the fly may convey the parasites directly from an infected to a healthy animal by flying to the new host immediately after sucking infected blood. This is doubtless true in surra transmission by the large horse flies.

At the present day, more than sixty species of trypanosomes have been described from different types of vertebrates and the greatest difference of opinion exists concerning their relationship and life history.

During the past decade our knowledge of the trypanosomal diseases has so grown by leaps and bounds that it may be truly said these hold at present a position of commanding interest.

The reason for this is not far to seek. It is not merely because six or seven of these diseases have been recognized in domestic animals in Asia, Africa, and South America. It is not wholly due to the discovery of a human form of the disease, but rather to the fact that the mastery by man of whole regions is called into question. The successful contest with malaria and yellow fever has now given place to the fight with trypanosomiasis, and upon the issue of this struggle depends to a large extent the destiny of tropical colonies.

It has been shown beyond any question that the transmission of sleeping sickness is effected by the bite of the tsetse fly (*Glossina palpalis*), and there is little doubt but that other species of this genus may also serve as transmitting agents. The ordinary biting flies (*Stomoxys*) and the mosquitos are supposed to be apparently incapable of spreading the infection. As in the case of nagana, the tsetse fly is able to convey the disease only within one or two days after it has fed on infected persons or on experimental animals. The fact that it is unable to produce an infection after two days indicates that the parasite does not multiply in the insect and does not pass through a life cycle such as has been worked out for the malarial organism.

The discovery a short time ago of flagellates in the stomach of tsetse flies led Koch and others to believe that *Tr. gambiense*

actually multiplied in the gut, but the studies of Minchin and his coworkers demonstrated that these organisms were harmless parasites peculiar to the fly and in no wise related to the human trypanosome. Investigators have been able to show that in the mosquito *Tr. lewisi* and *Tr. brucei* may live for at most two days and the exposure to the conditions prevailing in the stomach for a few hours is sufficient to so alter these organisms that they are no longer able to infect animals. The conclusion therefore is justified that the tsetse and other flies are mere passive and temporary carriers of the pathogenic trypanosomes, and this view may be accepted for the other insect carriers of flagellates. While it is true that no cycle of development has been worked out for *Tr. gambiense* in the tsetse fly it may be worth noting that an encysting form has been described by Minchin for *Tr. grayi*, the common parasite of *Glossina*. These observations are in line with those of Prowazek on the *Herpetomonas* of the mosquito.

The rôle of the mosquito in transmission of trypanosomiasis of mammals has not been definitely determined. Recent investigations have elucidated some important relations in birds. In the owl a blood parasite (*Halteridium*) has long been known, and Schaudinn has found that in the stomach of the mosquito (*Culex pipiens*) it becomes transformed into a trypanosome which presents three distinct types. Schaudinn regards these as male, female, and indifferent forms, and has been able to follow in detail the life history. They are inoculated into the owl by the bite of the mosquito to begin again the phase of the life history characteristic of that host.

The mechanism of transference to the warm-blooded host is extremely interesting, and as parasites of trypanosomiasis may possibly be transferred in the same way, it seems worth while to mention the details. *Culex pipiens* possesses esophageal diverticula which become distended with gas and may be termed "gas bags." This gas, carbon dioxide, is evolved by a sort of yeast-like fungus always present in the insect's stomach from traces of glucose present in blood, or—much more abundantly—from glucose present in the plant juices which the insect occasionally sucks. At the commencement of the act of suction, when the insect has its proboscis buried in the skin of its victim, its body undergoes one or more violent contractions which eject the contents of its foregut and "gas bags" into the skin. These contents comprise gas, saliva, and whatever particular matter is present—viz, yeast cells and sporozoites, the infecting organisms.

Once introduced into the owl the so-called indifferent forms enter the red corpuscles and transform into the *Halteridium* form. In this stage there is no multiplication such as takes place in human malaria; but at night, and also in spleen and bone marrow, these parasites leave the host cells to swim about as flagellate forms in the plasma, only to return by day. Six days suffice to bring these forms to the point of multiple fission which takes place in the plasma and produces many minute flagellate forms that reinfect the corpuscles with *Halteridia*. Later arise the sexual forms which are transformed as already stated in the stomach of the mosquito into trypanosomes.

At the present time nothing can be farther from settled than the happenings within the bodies of invertebrate hosts of trypanosomes, and much unfortunate controversy of an entirely unnecessary character has been filling the pages of medical and scientific journals.

Although mammalian trypanosomes were first observed and described by Lewis, in 1877, for *Tryp. lewisi* of the rat, and in 1880 for *Tryp. evansi* (the cause of surra in horses), little importance was attached to them as the causes of disease until Bruce, in 1894, demonstrated the connection between the disease nagana of horses in Africa of unknown etiology, and the tsetse fly diseases of horses. Very great importance attaches to the happenings within the body of the blood-sucking host, and here the matter is still in the whirl of controversy. Bruce states that in the hundreds of tsetse flies examined by him he has never found different stages of the parasite in the digestive tract and no indication whatsoever of migration into the body cavity of the fly. He regards the fly as a mere passive carrier of the protozoön, transmitting the disease during a limited period by inoculating the victim with trypanosomes adhering to the proboscis either inside or out. In this he is supported by Koch, Moore and Breinl, Novy, Roubaud, and a host of others, who note that the organisms disappear from the digestive tract of the fly within three or four days after feeding. Others, on the other hand, notably Gray, Minchin, and Tulloch, have found abundant multiplicative forms in the anterior part of the digestive tract, and encysted forms in the posterior part (proctodeum). These observers hold, and many others support them, that important developmental stages of *Tryp. gambiense* will yet be found outside of the host's body. That such an external life is obligatory for trypanosomes in general is disproved by the fact of direct transmission in the case of *Tryp. equiperdum*, where all of the developmental phases must take place in the mammal.

Another insect-borne disease, the epidemiology of which is rather obscure, is filariasis. This is a rather generic term for a number of diseases or for one disease which manifests itself in several ways, due to the presence in the body of the infected host of filaria or thread worms. All the species of the genus *Filaria* are parasites of other animals, living mostly in the stomach, intestines, sometimes in the connective tissue, and elsewhere. One species lives in the heart of dogs, another in the body cavity of horse, donkey, and ox; still another lives in the eyes of certain animals and negros. The young or larval filariæ live in the blood, but they finally lodge in the lymphatic glands and there mature.

It has been definitely proved that these filariæ actually live in the bodies of mosquitos and they are probably responsible for the dissemination of filariasis. The organism is taken into the alimentary canal of the insect with the blood sucked from the host affected. These filariæ work their way through the walls of the alimentary canal, and gather in the thoracic muscles. Here they live for some time. In two or three weeks they are ready for their further development in the blood and lymph of the animal host. Exactly how this transfer is made is not definitely proved as yet, although the mosquito bite is responsible for the transmission.

Manson suggested that the female mosquitos coming to any body of water to lay their eggs would often die there and their bodies fall on the surface of the water. As they disintegrated by rapid decay the larval filariæ in the thoracic muscles would escape into the water and live there until taken into the alimentary canal of animals drinking some of the water from the reservoir or pond.

Bancroft, on the other hand, believes that the filariæ are transmitted by the bite of the mosquito, having actually observed the migration of the filariæ from the thoracic muscles forward into the head and beak of the mosquito. It is certain at any rate that the mosquito is the actual disseminating agent of the disease.

A disease supposedly new to the Philippines threatens us to-day and bids fair to provide a problem for the morrow.

It is in the form of malignant jaundice in dogs, or canine piroplasmosis. It is common in various parts of China and India, and found endemic in native dogs in Madras, Hongkong, and other cities. These animals acquire tolerance and show but few symptoms.

The disease is caused by the blood parasite *Piroplasma canis* and the carrier is *Rhipicephalus sanguineus*, the common dog tick of India and China. It is one of the most widely distributed of the Asiatic ticks.

Tick infection is brought about hereditarily through the egg (proven by experimental infection) and stage to stage infection (judged from observations).

As in cattle-tick infection, which the disease closely resembles, the tick drops from its host after engorgement in each of its three stages, and whether in these it attaches itself to the same or different dogs is determined by chance. Reinfection by ticks is possible in a dog with a normal temperature and scanty parasites in the blood.

CURRENT NOTES ¹—DECEMBER.

TOBACCO SEED CLEANING.

Mr. R. W. Rowe, superintendent of the tobacco station at Ilagan, Isabela, has recently made a trip through the tobacco districts of Isabela and Cagayan Provinces demonstrating the use of the Bureau of Agriculture's tobacco seed cleaning apparatus and looking after general matters connected with tobacco production in that region. This trip was made in company with Mr. Manus, of the Bureau of Internal Revenue, who has been, together with Capt. W. A. Stegner, of the internal-revenue service, coöperating for some time in the popularization of modern tobacco methods and the standardization of the output of the valley. During a brief trip Mr. Rowe cleaned seed for 1,712 persons; in some cases it was impossible to clean all the seed brought by the planters, but so far as possible a certain amount was cleaned for each applicant; the quantities cleaned varied from 2 to 30 liters of seed for each planter. No charge whatever was made for the work. The native planters have realized for some time the great benefit derived from planting only the clean, heavy seed from which the chaff and immature seeds have been winnowed, and the apparatus is now regarded as a necessary part of the outfit of the tobacco planter in the Cagayan Valley; in this connection the Bureaus of Internal Revenue and Agriculture are taking steps to introduce an improved style of seed cleaner, the price of which will be within the reach of even the poorer class of planters.

Through the municipal president the growers of each town were advised of the probable date of Mr. Rowe's arrival so that they could come in to have their seed cleaned. At these gatherings Mr. Rowe made it a strong point to urge the planters to raise a moderate amount of corn, rice, and vegetables so that in case of failure of their tobacco crop they would not be in danger of starvation; heretofore the condition of the families of the poorer class in that valley has been very precarious since

¹ Original notes prepared by various members of the Bureau of Agriculture.

they depended very largely upon rice, purchased at exorbitant rates, for their existence. The Bureau of Agriculture is not only making strenuous efforts for better tobacco and more of it in the Cagayan Valley, but is gradually bringing about a *much healthier class of tobacco growers*.

A LORANTHUS AFFECTING CITRUS TREES.

In April of the present year near the town of Misamis, Mindanao, many of the citrus fruit trees, principally *Citrus decumana*, were found by Mr. D. B. Mackie, agricultural inspector, to be dying from the attacks of a parasitic plant of striking appearance. Specimens were sent to Mr. E. D. Merrill, the botanist of the Bureau of Science, who identified them as *Loranthus secundiflorum* Merrill. According to Mr. Merrill there are some twenty species belonging to this genus which are indigenous to our Archipelago, the particular one in question, however, being confined at present to the Island of Mindanao. It is a rather general parasite not showing any decided preference for the citrus varieties. Many of the species are very conspicuous on account of their masses of dark green foliage and their red, green, and yellow flowers.

While *Loranthus* is closely related to the *true* mistletoe (*Viscum*), both being parasitic on trees, the mistletoe sends its haustoria, or sucking roots, into the tissues of the host plant, while the *Loranthus* spreads its roots along the limbs and sends out runners which attach themselves to the branches at varying intervals.

In certain districts of the East, especially in parts of India and Assam, *Loranthus* is often a very destructive pest, where it is found on pear, peach, orange, and guava. In Assam, where it is found also on the tea plant, its foliage so closely approximates that of its host that the leaves of the parasite are often picked with the tea leaves, the presence of the parasite being noticeable only after the tea has been brewed through the bitter flavor imparted to it.

The fruit of these plants is rather small and oval in shape, the seed being surrounded by a very sticky substance by means of which it readily becomes attached to branches, etc.

According to observations in other countries birds are the principal agents of distribution, the larger passing them in the excrement while the smaller reject them from the mouth after consuming the pulp.

While this plant is not of great economic importance, yet with the advent of greater areas being brought under cultivation, it will in all probability become very troublesome.

COPRA DRIERS.

In view of the fact that the demand for good copra is slowly but surely increasing while the status of low grades is becoming more precarious it would seem that there is no time to be lost on the part of the producers in adopting some definite method by which they can secure a firm hold on the top of the market; that is, to standardize their output so that the buyers will be able to count upon getting A 1 material from them at all months of the year. In most of the copra-producing districts of the Philippines, however, it is almost impossible under present conditions to make even medium grades of copra during the rainy season, for without plenty of sunshine the "tapáhan" is a necessary evil until the producers decide to follow modern instead of antiquated practices. In several other countries, such as Samoa, and to a slight but increasing extent Ceylon, the great advantage of artificial driers is now recognized; strangely enough, however, in the greatest producing centers, like the Philippines, Indo-China, Malaya, and the East Indies, little or no attention has been given to this most important matter. It is a deplorable commentary on the progressiveness of the Filipino agriculturists that in this, easily the greatest copra producing country of the world, there are to-day in operation no copra driers which are turning out a smokeless article suitable for the higher grade copra products; however, Sr. Navarro at Pagsanjan has a huge concrete furnace (with no proper oven on top), and at least one rotary drier has recently been ordered from Europe; moreover several of the producers and dealers in copra are discussing the advisability of setting up modern drying apparatus. It remains for experiment to decide whether an oven with 3 or 4 trays, heated by steam or water pipes underneath, can be cheaply and easily set up on the average plantation. The Bureau of Agriculture is much interested in this matter and hopes to be able, in a few months, to advise the planters definitely in regard to this. The steam or hot-water system would have considerable advantage over the hot-air-pipe system because in the former case the copra could not be burned through carelessness or accident; the fuel, in either case, would be husks and shells, of course, and thus the running expense of such a plant would be practically nothing outside of the labor of charging and emptying the trays of the oven.

The Philippine coconut grower now has the chance of a lifetime to make himself as well as his product world famous.

MANGO PESTS IN CAVITE AND RIZAL PROVINCES.

In the June issue of the REVIEW an account was given by Mr. P. J. Wester, horticulturist of the Bureau, of a newly discovered mango pest in Cavite and Rizal Provinces. We quote from the article as follows:

Driving through Imus and adjoining barrios, the almost universally blackened and dead flowers on the mango trees at once attracted attention, and frequent stops were made for examination of the flowers. These were in most instances found to be covered with innumerable small wedge-shaped homopterous insects in all stages of development, able to fly or jump but short distances. * * * It is quite probable that this insect is identical with the so-called "mango fly" in India (three species of homoptera, *Idiocerus niveosparsus* Leth., *I. atkinsonii* Leth., and *I. clypealis* Leth.), which in certain years has been reported to reduce the mango crop to one-third of its normal amount in that country. In India these insects are present on the mango trees throughout the year, but hatch in great numbers every few years in the flowering season and destroy the bloom.

Specimens of these insects were forwarded to the Bureau of Entomology, United States Department of Agriculture, Washington, D. C., and advice has recently been had from Dr. L. O. Howard, Chief of the Bureau, that the insects are *Idiocerus clypealis* Leth., and *Idiocerus niveosparsus* Leth.

The same insects have since been found in Bulacan and some of the Visayas. The insect has not as yet been observed in Cebú.

HAT MAKING.

Hats are already made in considerable quantities in the Philippines and are excellent in their construction, but the material now at hand is such that they do not command the price they would were the material of better quality. Soil and climate in a large portion of the Archipelago are such that the Panama hat palm (*Carludovica palmata*) would succeed well here, and this plant introduced into the Philippines would furnish the wherewithal to make a hat of excellent quality in every respect, one that would command the very highest prices of all hats made of fiber, and we believe that the Filipino hat maker is fully equal in skill to her sisters in Panama, Colombia, and Ecuador. The Bureau of Agriculture is arranging for the introduction of seed of the Panama hat palm on an extensive scale, and it is hoped that before long this plant will be well introduced into the Philippines.

SERICULTURE.

Silk manufacture is an enterprise that would seem eminently well adapted to become a home industry among the Filipinos. For several years back attempts have indeed not been lacking by the Bureau of Science to establish the silk industry in the Islands, though so far with but little success. Lately the Bureau of Education has shown considerable interest in the encouragement of silk culture among the rural population in the Philippines, and large quantities of mulberry cuttings have been supplied to that Bureau by the Bureau of Agriculture.

Through its teaching force the Bureau of Education is undoubtedly in more intimate touch than other Bureaus with the people to whom sericulture would be of most importance, and it is hoped that its efforts may be successful. The home demand is already very considerable, silk having been imported into the Philippines in 1909 to the value of \$995,110.

VANILLA GROWING.

Notwithstanding an almost ideal climate for the production of vanilla and an abundance of cheap labor, no attempt has been made to grow this plant in the Philippines. Vanilla culture, in the pollination of the flowers and in the packing of the beans and curing them for the market, is to a very large extent dependent for its success upon close attention to details; this is work, light in itself, which can easily be performed by women and children, and the finished product would find a ready market. Believing that vanilla may profitably be cultivated here, the Bureau of Agriculture has arranged to introduce all cultivated species for the purpose of testing their adaptability to the Philippines.

API CULTURE.

It is remarkable, after thirteen years' occupation of the Philippines by Americans, that honeybees have not yet been introduced into the Archipelago, though honey was imported in 1909 to the value of \$4,956, and the great income derived from the apiaries in Hawaii, where beekeeping has grown to a great industry, is well known. The care of a few beehives is not arduous and the honey therefrom would be a source of comfort to the family table; in addition, the income derived from a few properly cared for hives would be far from inconsiderable. Recognizing the possibilities for this industry in the Philippines, the Bureau of Agriculture, through the Bureau of Supply, has recently ordered from Honolulu 6 bee colonies, together with the material necessary for their proper care and attention.

POP CORN.

Perhaps the newest industry in the Philippines is that of American pop corn. Though the Filipinos were familiar with a type of rice which pops, the American pop corn put out in the form of "Crispettes," or brickettes, of whole popped kernels moistened with white-sugar sirup, was a new food to them; beginning as a dessert confection it is now ranking as a real food and about a ton of corn is now made up weekly, most of which is consumed locally. Nearly all of this corn has to be imported from the Pacific coast at undue expense. The Bureau is beginning experiments to determine what varieties of pop corn are best adapted to Philippine conditions, and as soon as this matter can be worked out, the Filipino agriculturist will have another very profitable crop on his "waiting list," and it is hoped he will immediately take advantage of this excellent opportunity.

MONTHLY VETERINARY REPORTS—OCTOBER AND NOVEMBER.

By ARCHIBALD R. WARD, *Chief Veterinarian.*

Albay and Ambos Camarines.—The animal disease situation remains unchanged, there being no rinderpest.

Bataan.—Rinderpest infection is more widely disseminated than previously and six municipalities are now infected. As the force of the Bureau of Agriculture is not sufficient to combat the disease in this province the responsibility is still left with the provincial governor as it has been since April. A representative of the Director of Agriculture in the province with a very few assistants acts in an advisory capacity to the governor.

Batangas.—The municipality of Lobo is the only one known to be infected.

Bohol.—One municipality in this province is known to be infected.

Bulacan and Pampanga.—No material changes have occurred in these provinces. The provincial governor of Pampanga, who is responsible for the work in this province, is making a determined effort to control the disease.

Cagayan and Isabela.—One municipality in each province is now known to be infected—Solana and Ilagan, respectively.

Cebu.—The disease is widely disseminated in seven municipalities.

La Laguna and Rizal.—As anticipated in the previous report a vigorous search in these provinces revealed infection in one municipality—Pangil.

Leyte.—Infection is known only in the municipality of Sogod.

Oriental Negros.—Rinderpest is present only in Dawin and Bakong.

Pangasinan.—New cases are occurring only in Mangatarem and Bayambang. The Philippine Scouts are being removed from this province, merely enough being left on the southern border to give protection against infection from Tarlac and Nueva Ecija. The majority of the troops are to be temporarily removed from

quarantine service for the annual target practice, after which work will be undertaken in Tarlac and Nueva Ecija.

Tarlac.—Infection is still present in five municipalities and progress will be slow until sufficient Scouts are available to carry on the work. In the meantime a large portion of the employees of the Bureau of Agriculture will be removed from Pangasinan and will occupy the northern portion of Tarlac.

Zambales.—There is still some infection in four municipalities, though very restricted, as only six barrios are infected. The work in the province has shown a remarkable improvement during the present fiscal year, since at the beginning thirty-five barrios in five municipalities were infected.

General conditions.—The rinderpest situation throughout the Islands in general, shown by weekly reports, shows a satisfactory improvement. On July 3 seventy-six municipalities were infected; at date of writing, November 7, forty-five municipalities are known to be infected. The reported deaths per week have dropped from 149 on July 8 to 54 per week on October 28, the latest date for which accurate data are available.

It is becoming more and more evident that the work of the Philippine Scouts in the rinderpest campaign is being directed by their officers in such a way as to cause practically no ill feeling on the part of the stock owners. Official communications by the provincial governor of Pangasinan and by the lieutenant-governor of Siquijor attest to the fact that the people in these districts entertain the kindest feelings toward those who have been directly responsible for the details of the successful rinderpest campaigns carried on.

BOOK REVIEWS.

By O. W. BARRETT,

Chief, Division of Experiment Stations.

CACAO.

Cacao, a new manual on the cultivation and curing of cacao, by J. Hinchley Hart, late superintendent of the Royal Botanic Gardens of Trinidad, British West Indies, is a masterpiece of the kind and although based very largely upon the author's experience in the Islands of Trinidad and Tobago, the chapters on gross culture, harvesting, fermenting, and curing of the "bean" contain a large amount of excellent material applicable to all cacao-growing districts of the world. The late Mr. Hart was an authority on the classification of cacao types, having made a thorough study of this matter, both in Central America and the West Indies. The chapter on the agricultural chemistry of cacao contains some very interesting and important data on the constituents of the seed, pulp, pod, leaves, etc.; the question of chemical fertilizers is also gone into to some extent. There is also an interesting chapter on production with statistics of the various producing centers of the world, and a chapter on the mechanical appliances used on modern estates in handling the crop.

It is unfortunate that Mr. Hart never became converted to the "no-shade idea" which has been gaining ground rapidly in cacao-growing countries; to the last he advised the planters to "stick to the bridge which carries you safely over," that is, not to try any cutting out of shade in the plantations. This is probably the only adverse criticism which the book will receive from the average planter. The volume contains 64 illustrations and 301 pages, and is published by Messrs. Dockworth & Co., of London. It should be in the hands of every prospective cacao grower in the Philippines.

LES KOLATIERS ET LES NOIX DE KOLA.

The world has been puzzling for years over the question of kola varieties. It appears that some 3 or 4 species were introduced into the Tropics of both Hemispheres from the Gulf of Guinea region of West Africa; some of these species succeeded well in tropical America and a few have done fairly well in the Orient.

At last a work has been put before the public which settles once for all the various controversies about nomenclature of the kolas and, at the same time, gives the world a large amount of information concerning the production, commerce, uses, etc., of this very important nut. The title is *Les Kolatiers et Les Noix de Kola*, by Aug. Chevalier and Em. Perrot. It is published in Paris by Aug. Challamel, at the price of ₣8 (20 francs); it forms Volume 6 of the huge publication, *Les Végétaux Utiles de L'Afrique Tropicale Française*; it contains 500 pages and is well illustrated.

The principal author, M. Chevalier, has been engaged for several years in agricultural explorations in French West Africa; through his kindness the writer had the honor of introducing into the Western Hemisphere a collection of the very interesting tuberous mints which are grown for human consumption over a large district on the Guinea coast and which may become one of the great starch crops of the future. M. Chevalier ranks among the very best of the modern tropical agronomists and this present monograph on kola evidences his intense interest in and very thorough knowledge of the subject which has puzzled both botanists and commercial agents until now.

Kola may some day become a standard crop in the Philippines. Only recently has the commercial world begun to take a deep interest in the possibilities of kola production, but when we remember that about 20,000 tons of fresh kola nuts are actually produced annually (of which only some 1,000 tons reach Europe and the United States) the bulk being consumed in the various districts of the Sudan and West Africa—and even there the supply is far below the demand—we can readily understand the anxiety which M. Chevalier feels concerning the future status of his 5 distinct species and 10 good varieties of a possible rival to the 3 great beverages of to-day—tea, coffee, and chocolate.

MARKET REPORTS.

NOTES ON MANILA MARKETS FOR OCTOBER.

By K&R & Co.

(Based on advices from New York, September 28; San Francisco, October 3; London, October 6, Hongkong, October 28; Iloilo October 28, Cebu, October 28.)

SUGAR.

Iloilo.—Coming crop is estimated at 125,000 tons. Further business has been done for January-March delivery basis ₱9 per picul first cost 88° but at the close market is easier.

Manila.—It is estimated that 1911-12 crop will reach 80,000 tons; some trifling business done for January-February delivery basis ₱7.75 per picul cost 88°.

MANILA HEMP.

Dull and we quote United States current ₱8.50 and United Kingdom ₱7.75 per picul first cost say £18/15/- and £17/5/- per ton f. o. b. Values of better grades also easier and we quote good current ₱15 per picul cost say £29/15/- per ton f. o. b.

Receipts at all ports for the ten months were 1,050,432 bales against 1,133,819 bales 1910 and 1,075,009 bales 1909 for the corresponding period.

COPRA.

Quiet at ₱12.75 Cebu f. m. s. and ₱11.50 Manila f. m. per picul first cost say £23/10/- and £21/5/- per ton f. o. b.

DISTRIBUTION OF PRINCIPAL PHILIPPINE EXPORTS FOR THE TEN MONTHS.

[January to October, 1911.]

Products exported.	United States.	China.	Pacific coast.	Great Britain.	Continent of Europe.	Australia.	Japan.	Singapore.
Dry sugar..... tons.	165,962	15,723	13,100	3,344				
Hemp..... bales.	398,945	8,960	42,858	898,547	84,108	21,695	20,384	9,888
Copra..... piculs.	37,760		158,680	59,200	1,823,488		2,817	
Cigars... thousands.	13,999	29,698	16,999	10,489	12,078	9,758	991	12,524

MANILA AND LONDON FIBER MARKET.*Receipts and shipments of Manila hemp.*

[Telegram from Manila to London, November 6, 1911.]

	1911	1910
Hemp receipts at:	<i>Bales.</i>	<i>Bales.</i>
Manila since January 1	838,815	887,194
Cebu, etc., since January 1	232,207	266,448
All ports since January 1	1,066,022	1,158,642
Shipments by steamer to:		
United Kingdom, cleared since January 1	414,033	417,719
Atlantic coast, United States, cleared since January 1	309,319	428,580
Pacific coast, United States, cleared since January 1	136,379	98,080
Continental ports, cleared since January 1	84,108	68,122
Shipments to:		
All other ports	61,208	
Local consumption since January 1	24,920	
	86,128	68,478
Loading steamer on the berth for:		
United Kingdom, about		32,000
Atlantic coast, United States, about		
Pacific coast, United States, about		7,000
Continental ports, about		
Shipments per sailer to Atlantic coast, United States, since January 1		20,650

LONDON FIBER MARKET.

The following prices for Manila hemp, sisal, and maguey were quoted by Messrs. Landauer & Co., London, September 27, 1911: ¹

Manila hemp.—Receipts for the week are cabled as 25,000 bales against 36,000 bales for the corresponding week last year.

There is no change to report in the position of fine hemp the value of good current remaining £33 to £33/10/—, with the higher grades on the usual basis.

Range prices.

Grades	Spot and close by—		
	Per ton	Per ton	Per picul.
Best marks	40/-—43/-	₹400.00—₹430.00	₹25.00—₹26.90
Good marks	38/-—40/-	380.00—400.00	23.75—25.00
Good current	34/-—34/6	340.00—348.00	21.25—21.43
25 per cent over current	22/-—22/6	220.00—228.00	13.75—13.95
Fair current	20/-—20/3	200.00—201.50	12.50—12.59
Superior seconds	19/6—19/9	193.00—194.50	12.10—12.16
Good seconds	19/3—19/6	191.50—193.00	11.97—12.10
Fair seconds	19/-—19/3	190.00—191.50	11.85—12.97
Good brown	18/9—19/-	184.50—190.00	11.55—11.85
Fair brown	18/9—19 -	184.50—190.00	11.55—11.85

Sisal hemp.—In somewhat better demand, the price in New York having advanced to 4½ cents, equal to £20/15/— to £22, c. i. f. Europe. A few parcels on spot on this side obtainable at £20/15/— to £21.

Manila maguey fiber.—Quieter. Values £19 for No. 1, Cebú, £16 ordinary No. 1, £15 No. 2 and £13/15/—.

¹ These quotations are in pounds and shillings English currency per ton. One pound equals about 10 pesos Philippine currency. One ton equals approximately 16 piculs.

PRINCIPAL PHILIPPINE IMPORTS AND EXPORTS— SEPTEMBER, 1911.

By the COLLECTOR OF CUSTOMS.

IMPORTS.

Articles		Manila	Cebu	Hollo	Jolo.	Zam- bounga.	Bala- bac.	Totals.
Rice	(Kilos.....)	19,021,829	3,929,617	2,768,009	331,250	485,290	408	26,536,403
	(Value.....)	\$788,175	\$189,750	\$97,775	\$15,870	\$21,829	\$20	\$1,058,419
Beef cattle	(Number.....)	853						853
	(Value.....)	\$24,352						\$24,352
Eggs	(Dozens.....)	234,152	108	200	63			234,523
	(Value.....)	\$25,978	\$13	\$24	\$7			\$26,022
Sugar	(Kilos.....)	280,054	20,243	19,975	7,861	10,120	99	338,552
	(Value.....)	\$20,343	\$1,675	\$1,363	\$592	\$719	\$10	\$24,702
Coffee	(Kilos.....)	122,389	747	2,839	341	2,773		129,089
	(Value.....)	\$35,814	\$241	\$920	\$101	\$660		\$38,986
Cacao	(Kilos.....)	31,386	2,527			12		33,925
	(Value.....)	\$9,467	\$710			\$14		\$10,191

EXPORTS.

Hemp	(Kilos.....)	5,839,644	2,776,629	354,200	18,724			8,989,197
	(Value.....)	\$559,741	\$278,283	\$35,000	\$1,665			\$869,689
Copra	(Kilos.....)	15,785,878	3,895,121	9,975	126,014	207,316	915	20,025,249
	(Value.....)	\$1,235,784	\$856,477	\$1,040	\$11,981	\$17,322	\$60	\$1,324,664
Sugar	(Kilos.....)	1,264,829	675,902	28,976,499				30,017,230
	(Value.....)	\$74,511	\$44,200	\$1,598,155				\$1,716,866
Cigars	(Thousand.....)	12,068						12,068
	(Value.....)	\$156,333						\$156,333
Cigarettes	(Thousand.....)	2,464						2,464
	(Value.....)	\$2,628						\$2,628
Tobacco	(Kilos.....)	963,213				4		963,217
	(Value.....)	\$137,806				\$5		\$137,811

TEMPERATURE AND RAINFALL FOR AGRICULTURAL DISTRICTS IN THE PHILIPPINES.

By the DIRECTOR OF THE WEATHER BUREAU.

SEPTEMBER, 1911.

[Temperature and total rainfall for twenty-four hours beginning at 6 a. m. each day.]

Date	Hemp				Sugar, Iloilo.		Rice, Tarlac		Tobacco.			
	Albay		Tacloban.		Temperature	Rainfall	Temperature	Rainfall	Aparri		San Fernando	
	Temperature.	Rainfall.	Temperature	Rainfall					Temperature.	Rainfall	Temperature	Rainfall
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
1	27.8		28.2		27.6		25.6	42.6	26.0	12.7	26	14
2	28		28.5		27.3		27.8		27.6		28.4	
3	28		28.2		26.6		28.4	2.8	28.3		28.7	
4	27.8		28.6		26		27.4		27.2		28.8	
5	27.9		27.9	8.8	25.8		28	3	28.4		29	
6	27.8		26.5	27.4	25.8	.8	27.9	9.1	28		28.8	
7	27.5	8.4	28.2		25.6	33	28.4	10.9	27.8		27.5	
8	27.9	1.3	27.7		25.8	2.8	28.3		27.9		27.4	
9	27.3	9.9	27.2	3.1	26.6	.8	29		27.8		28	
10	28.4		27	21.1	26.1	.6	28.6		27.3		28.1	
11	27.4	85.1	26.8	1.8	25.5	49.8	28.8		27.5		28.7	.3
12	27.9	.5	26.8	1.5	26		28.7	3.6	27.1		28.8	
13	27.7		26.9		25.6	28.2	29.8	1.3	27.4		28.6	.3
14	25.6	.5	27.7		26.3		28.5		27.6		28.3	
15	26.8		27.8	3.8	27.1		29.2		26.8	11.4	27.8	
16	27.8	1	27.1	13	27.6	9.2	27	11	27	261.1	27.1	41.1
17	27.6	3.8	28.6		26.9	28.7	28		24.1	24.6	26	90.1
18	26.3	4.3	27.8		26.3	22.4	27.2		25.6	6.1	26.8	
19	26.9	.5	27.6		26	6.9	27.2		26	.8	27.5	1
20	27.5		27.6	1.3	27		27.2	12.2	26.7	12.8	27.6	
21	26.8		26.1	18.5	27	.8	27.6	6.6	26.6	6.4	28.6	3.8
22	26.9	71.1	25.9	20.8	26	2.8	28.6	29.2	26.9		27.2	.5
23	27.4		26.6	17.8	26.2	.8	28.3		27.2		27.4	
24	25.9	.8	26.9	.8	26.2		28.4		27	2.5	27.7	
25	27.8	.8	27.8	3.8	26.4		29.4		26.7		28.2	
26	27.6	2.6	28.9		26.8	1.8	28.6	1.3	27	21	28.2	28.4
27	28.1	.8	29		28.2	22.4	25.6	22.9	26	52.8	25.7	73.7
28	27.2	1.8	28.6		25	56.6	26	13.3	23.9	26.9	24.7	131.8
29	26.7		27.5		26.6	10.4	24.8	54.1	24.9	1.8	25.8	54.3
30	26.8		27.2		27.2		27	52.6	34.4	.2	25.4	23.9

CROP CONDITIONS SUPPLEMENT

THE PHILIPPINE

Agricultural Review

VOL. 4

DECEMBER, 1911

No. 12

HEMP.

Albay.—The usual amount of harvesting is going on. There has been no damage to the growing hemp and its general condition is fair.

Iloilo.—The present dry weather favors harvesting, and considerable fiber is being marketed at ₱18 per 63 kilos. The growing crop is in good condition.

Oriental Negros.—Present quotations on this fiber are rather low, standing at from ₱7 to ₱7.30 per 63 kilos.

Samar.—There has been no change in prices since the last report. The general condition of the fields is very good.

Surigao.—Many hemp fields are being abandoned because of the small yield. Present prices at ₱10.20 for the coarse, and ₱11.20 for the fine hemp.

COCONUTS.

Albay.—Considerable harvesting is going on, and no damage to the growing trees has been reported. The general condition of the crop is very satisfactory.

Capiz.—No damage from either storms or insects has been reported; in Capiz the general condition is only fair, but in Romblon reports indicate an excellent crop.

Cebu.—Considerable planting and harvesting is being done; the general condition of the planting is excellent.

Ilocos Norte.—An unusually large number of new plantings have been made; however, considerable damage is reported from a black beetle which destroys the leaves; condition of the growing crop, fair.

Iloilo.—Considerable copra is being made and placed on the market. The general condition of the fields is satisfactory.

La Laguna.—The general condition of this crop is satisfactory, and some new plantings are being made. From ₱10 to ₱11 is quoted per 63 kilos.

Samar.—In the municipalities of Oras, Dolores, Salcedo, and Llorente the ordinary amount has been harvested. In Basey, Guiuan, and

Borongan the plantings destroyed formerly have not yet been restored. Some production of copra.

Surigao.—Considerable interest is being shown in this crop, the plantings being very largely extended. The price of copra ranges from ₱10 to ₱11.50 per 63 kilos.

CORN.

Bohol.—A good harvest of this crop is expected on account of the plentiful rains during the month of October. In a short time corn will be harvested, and will relieve the condition of some of the people who have been forced to use the "buri-palms" as a means of subsistence.

Cebu.—Both planting and harvesting are going on at the present time. The general condition of the plantings is excellent.

Ilocos Norte.—Early plantings are already in and a large area is being prepared for later plantings in this crop.

Iloilo.—Harvesting is almost finished, the amount produced coming up to earlier expectations. There has been no damage from storms or insects.

Surigao.—Considerable more land was planted to this crop this year than last. The harvesting has just finished. Considerable damage was done by worms and locusts. Present price of the shelled corn, ₱3.50 per 75 liters.

RICE.

Batangas.—The rice crop is a failure all over the province owing to the continued dry weather.

Bulacan.—On account of the recent drought considerable loss will be suffered in this crop unless early rains come to relieve the situation.

Capiz.—The harvesting season is nearly over throughout the province, and no damage is reported; the general condition is good.

Ilocos Norte.—No rain has fallen in this province since October 1, and for this reason the crop is being severely damaged by dry weather. The damage to this crop will undoubtedly reach a general average of 40 per cent. About 20 per cent of the crop is usually exported from this province each year from various causes. This would leave the usual below normal conditions.

Ilocos Sur.—The rice crop coming on is in most places very poor, as there has been no rain since September 30. In some places the fields are drying up, and in others, even where irrigated, they are not looking well. From all present appearances the rice crop will be poor.

Iloilo.—In some municipalities this crop has suffered from rats and drought. The general condition is fair.

La Union.—A scanty harvest is feared from early plantings on account of the drought; later plantings are in somewhat better condition. The mountain rice is now being harvested.

Leyte.—Rice in many parts of the province is just beginning to be harvested. This crop throughout the entire province is in excellent shape and a larger harvest is looked for during the next three months than during the same period of last year.

Pangasinan.—This crop ~~has~~ suffered somewhat from rats, from the flood at the beginning of, and from the drought at the end of the month.

Tarlac.—This crop is looking well and a good harvest is expected.

SUGAR CANE.

Batangas.—The growing cane is in excellent condition and a good harvest is expected.

Bulacan.—The rats are still doing considerable damage to the growing cane especially in the lowlands.

Cebu.—Considerable harvesting is being done and the general condition of the plantings is excellent.

Ilocos Norte.—Considerable grinding has been going on and the condition of that part of the crop still unharvested is fair.

Iloilo.—The dry weather is bringing about an early maturity of the cane, the general condition of which is satisfactory.

Tarlac.—Sugar cane is looking well and a good crop is expected; the mills are now being made ready for grinding and boiling.

Indian Agricultural Research Institute (Pusa)

LIBRARY, NEW DELHI-110012

This book can be issued on or before

Return Date	Return Date